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UNITED STATES DEPARTMENT OF AGRICULTURE • Agricultural Marketing Service
Agricultural Research Service

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Seasonal Demand for Beef, Pork, and Broilers

By B. F. Stanton

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Changes in the nature of the demand for meat in the postwar years, as contrasted with prewar, is of particular interest and concern to the livestock industry. Most statistical studies of demand that have been made used annual time series data. However, differences in demand within the span of a year also appear to exist. In the study reported in this paper, quarterly data for beef, pork, and broilers were examined. An important difference in the nature of demand for pork between summer and winter was identified. While demand in winter approximates unit elasticity, that in summer is much more inelastic. In contrast, demand for broilers is stronger in summer than in winter. No significant difference in seasonal demand for beef was located. The author acknowledges with appreciation the many suggestions and help given him by Anthony S. Rojko, Arthur A. Harlow, and Hyman Weingarten, of AMS, in carrying out this analysis and in preparing the manuscript.

MOST EFFORTS to study demand in the aggregate are based on past experience, using annual time series data and statistical techniques of one kind or another. A number of limiting assumptions are always required. One is that consumer demand has been relatively stable during the time period covered. A second is that shifts in the supply relationship are primarily responsible for movements along the demand schedule.[1] As Working[2] pointed out in 1927, these assumptions are both heroic and necessary if estimates of demand relationships are to be made. But the importance of these necessary assumptions must not be forgotten or ignored as the intricacies of a statistical model absorb one's attention.

The demand for meat in the United States at retail, wholesale, and the farm has been the subject of many careful studies during the postwar period. A wide range of statistical models of varying complexity have been used to approximate the actual market situation. Most have relied on the use of annual data. Aggregate consumer demand necessarily has been visualized as being relatively constant throughout any given year. At least, changes within a year were assumed to correspond with the annual pattern over time. Little formal work has been done with time series data to investigate the nature of consumer demand for meats within the span of a year.

But can we assume that demand for individual meats remains constant throughout the year? Are there important seasonal differences? Are seasonal differences stable or regular enough in character to be identified? The purpose of this paper is to investigate these questions.

Scatter Diagrams and Simple Regression

An indication of seasonal differences in demand is obtained when deflated retail prices are plotted against per capita consumption of individual meats by quarters during the postwar years. Differences in demand between seasons of the year are reflected by a change in slope or level of the demand curve, or both. Quarterly data are available for the 12-year period (1948–59) for all three meats. This period seems appropriate for beef;

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[1] Shifts in the demand schedule resulting from changes in income or the prices of competing products are permitted, and are explicitly allowed for, in the statistical model used. Changes in supply are still necessary to identify a demand relationship as such.

[2] Working, E. J., "What Do Statistical Demand Curves Show?" *Quarterly Journal of Economics*, February 1927, pp. 212-235.

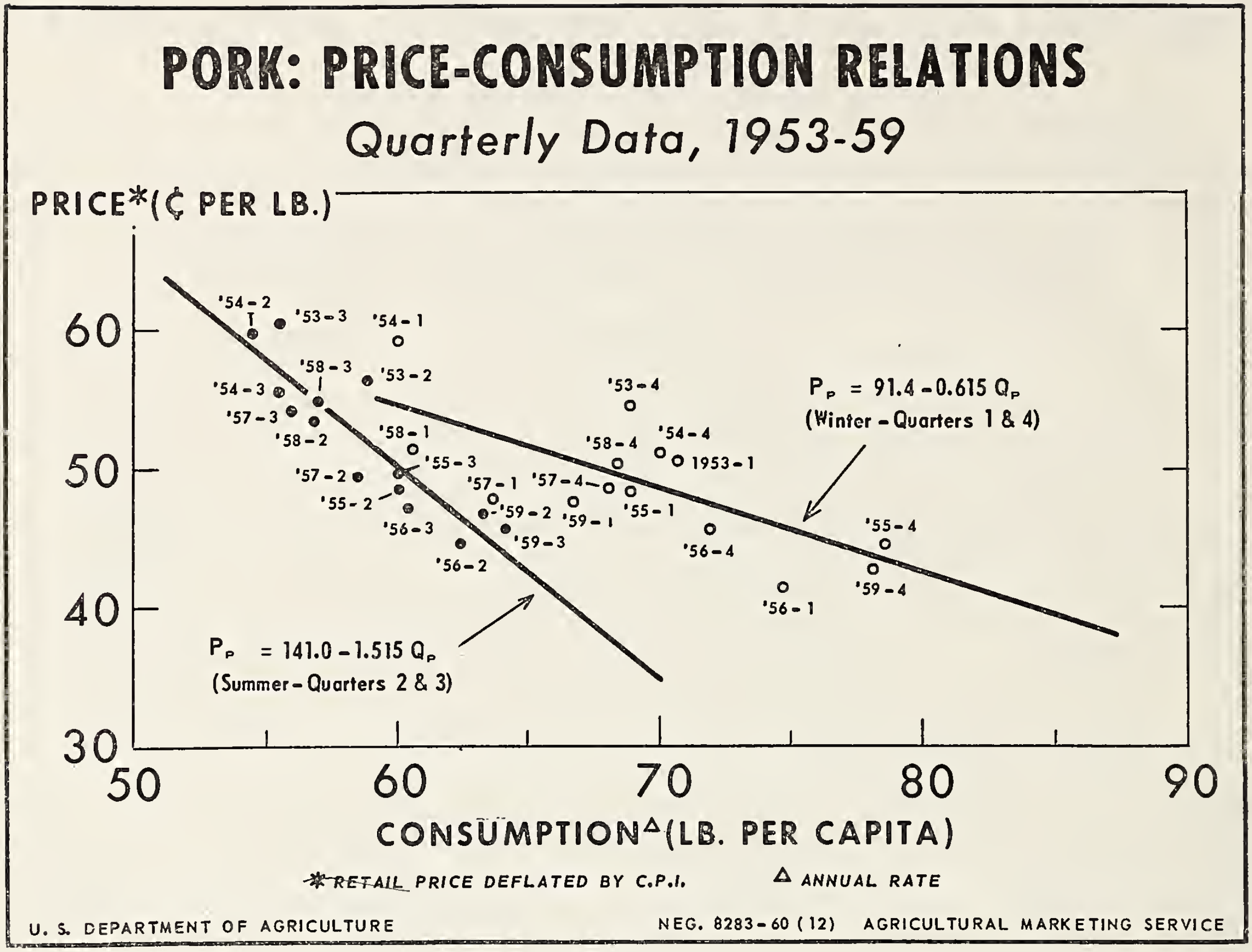

Figure 1.

the period 1953–59 is perhaps more meaningful for pork and broilers. A downward shift or decrease in demand for pork apparently occurred during the late 1940's and early 1950's. Increased consumption of beef and broilers at lower prices since 1952 may account for much of this shift. Broiler consumption has increased steadily during the last 12 years. But only in recent years have broilers been generally available on most of the national market.

Pork

The relationship between deflated retail prices and pounds of pork consumed per capita for 1953–1959 is shown in figure 1. Nearly all of the observations for the first and fourth quarters are above and to the right of those for the second and third. This indicates that probably separate demand curves are needed for summer and winter. For ease of discussion the second and third quarters are referred to as "summer" and the first and fourth as "winter," although these two terms are not fully descriptive of the time periods involved.

The summer price-consumption relationship covers a relatively narrow range of quantities and a relatively wide range of prices. The slope of the simple least squares regression line for the summer analysis is -1.515. This means that a 1.0 pound increase in consumption is associated with a decrease in retail price of about 1.5 cents on the average. In contrast, the slope of the regression line for the winter period is -0.615. This relationship includes a much wider range of quantities with about the same divergence in retail prices as in summer.

The two regression lines shown are not necessarily as good approximations of winter and summer demand curves for pork as might be drawn. These lines represent gross relationships.

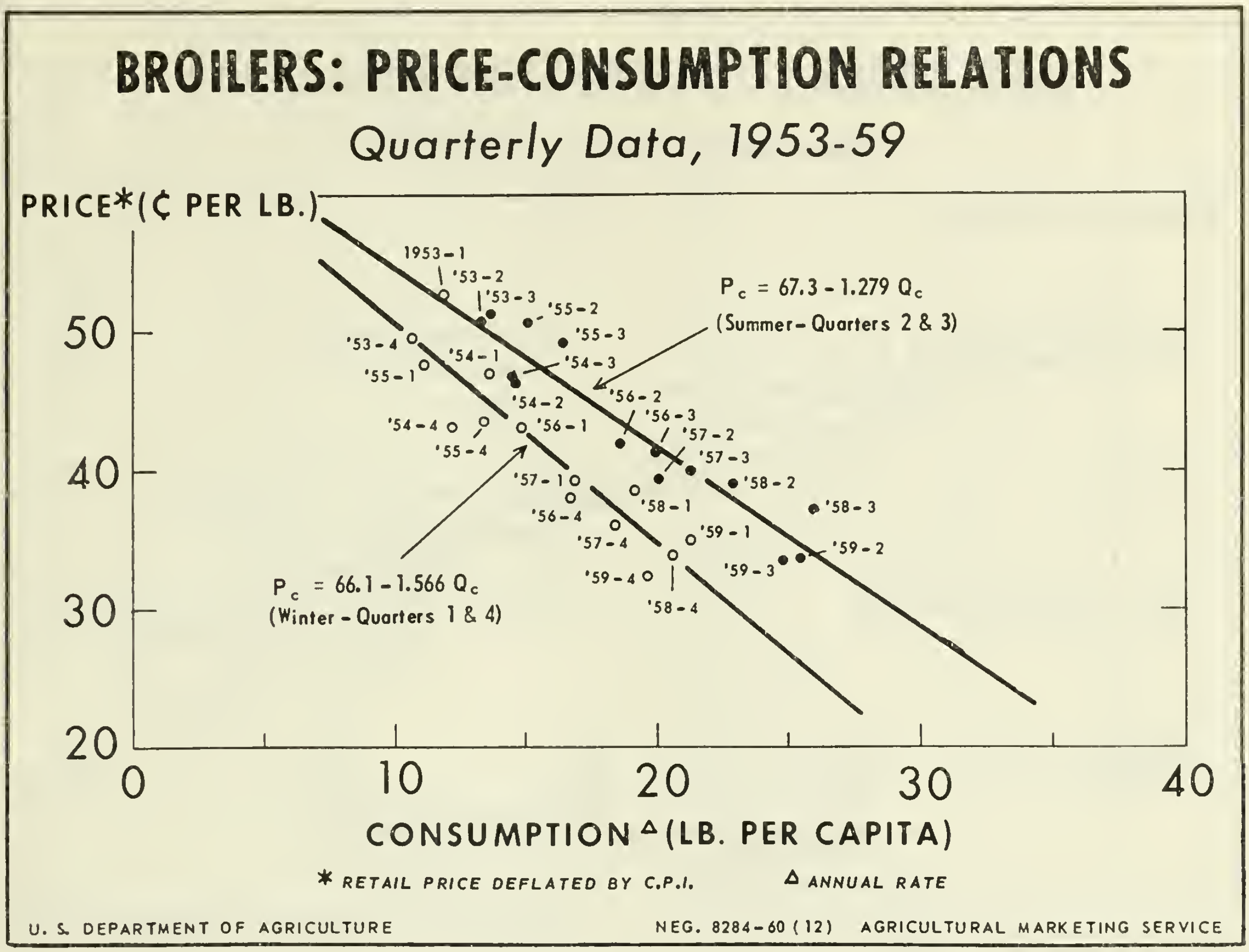

FIGURE 2.

Other factors, such as changes in income and the prices of other meats, may tend to obscure the true demand relationships.

Broilers

Deflated retail prices for ready-to-cook broilers are plotted against consumption per capita by quarters in figure 2. In contrast to pork, observations for the second and third quarters in each year are generally above and to the right of those for the winter quarters. It appears logical that consumers have a greater demand for pork during the winter months and a more limited demand during the summer. Pork does not lend itself as readily as beef and young chicken to broiling or summer cookery. The relatively high fat content of pork may also reduce its popularity during the summer months. Broilers, on the other hand, lend themselves well to summer use. During the winter months they must compete more directly with turkey and roasting fowl. Hence a stronger summer demand seems logical.

There appears to be a measurable difference in the level of demand for broilers between summer and winter. The variability around each of the lines of regression drawn through the two sets of plotted observations is small. The respective coefficients of determination are 0.90 in summer and 0.85 in winter. The differences exhibited between the summer and winter price-consumption relationships are less striking than those for pork. Yet they are large enough to be of interest and possible importance to producers, processors, and retailers.

Beef

Demonstrating that a difference exists between the summer and winter price-consumption relationships for beef is much more difficult. As noted

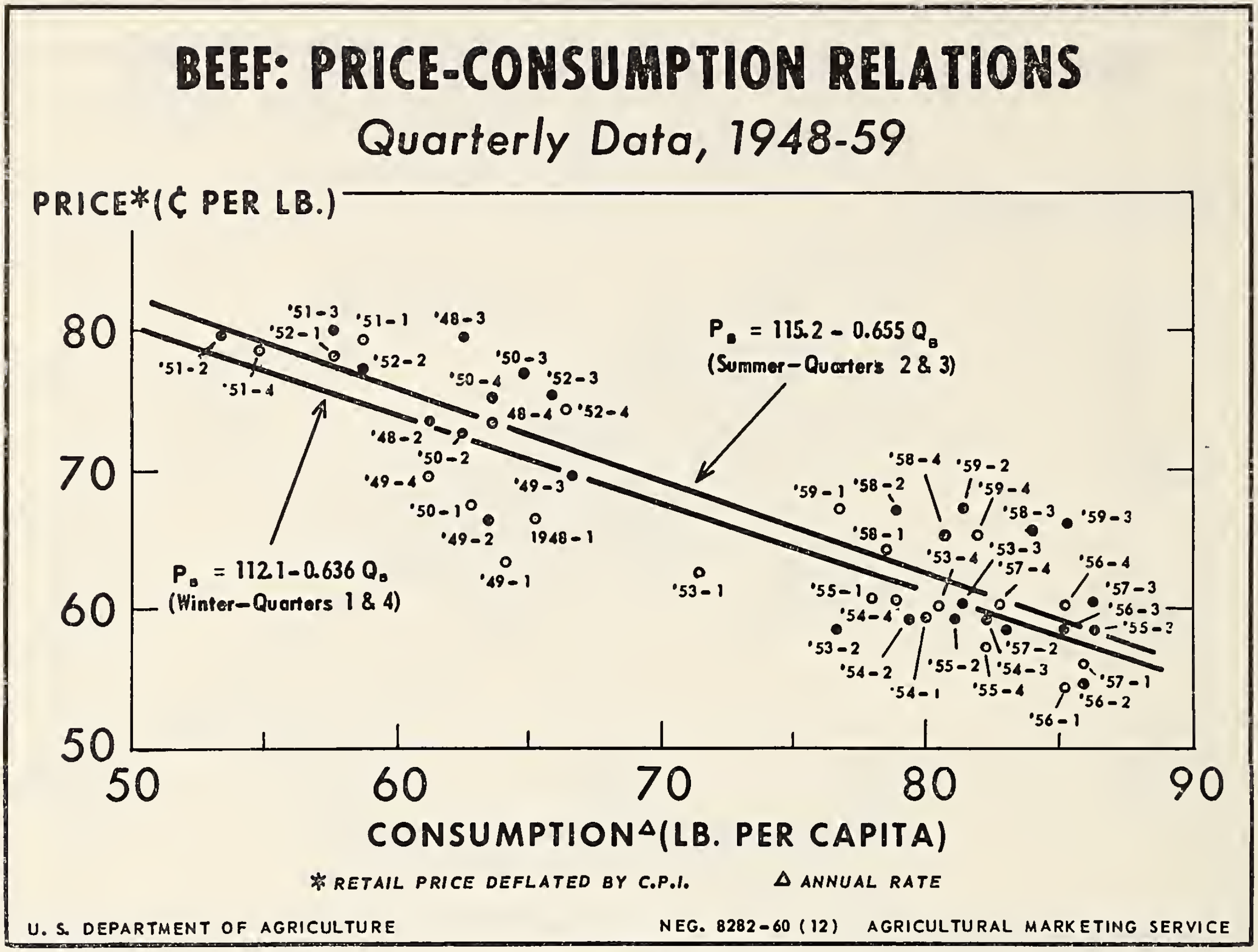

Figure 3.

earlier, looking at the price-quantity observations since 1953 by themselves is not very helpful. Prices have fluctuated quite widely over a relatively narrow range of consumption as shown in the lower right hand quadrant of figure 3. In addition, retail prices averaged about 5 cents more in 1958 and 1959 for equivalent levels of consumption than for the preceding 5 years. In general, the third quarter observations are above and to the right of the rest. The first quarter observations are generally somewhat below and to the left of the others.

When the price-quantity data for the second and third quarters were treated separately from those for the first and fourth, the calculated, simple regression lines had similar slopes. The line of average relationship for the summer months lies from 1.5 to 2.0 cents above that for the winter period. Considering the amount of variability in the observations around these lines this difference is not clearly significant.

General

All of the conclusions drawn concerning differences between summer and winter demand for pork, broilers, and beef from these scatter diagrams must be based in part on a number of assumptions. Demand in each season is assumed constant for the period of time covered. Movement along the demand relationship results from changes or shifts in supply. Deviations from the "true" line of relationship result from other variables, such as the prices of competing meats. The term "price-consumption relationship" is therefore most appropriate for the regression lines presented.

Despite these limiting assumptions, the scatter diagrams provide some rather telling evidence that real differences in seasonal demands do exist for pork. The case for broilers is not as clear, though summer prices and consumption levels are generally higher than those in winter. No clear difference was shown for beef.

Method of Analysis

While simple price-quantity diagrams provide a good indication of whether differences in seasonal demand exist, they do not take into account the influence of other variables which have an important effect on price and consumption. After all, the price of beef as well as the price of pork has some effect on pork consumption. The level of income has usually been considered an important demand shifter. And changes in tastes or trends in demand occur as well.

Demand theory conventionally specifies that, for an individual consumer, the quantity of the commodity consumed depends upon its own price, prices of competing items, the individual consumer's income, and factors that reflect changes in tastes and preferences. Market demand, which is our concern here, is the summation of these individual demands and may be defined as follows:

$$Q_b = f(P_b, P_p, P_c, Y, u_1) \qquad (1)$$
$$Q_p = f(P_b, P_p, P_c, Y, u_2) \qquad (2)$$
$$Q_c = f(P_b, P_p, P_c, Y, u_3) \qquad (3)$$

where the Q's represent the aggregate per capita consumption of beef (Q_b), pork (Q_p), and broilers (Q_c), the P's represent the market prices for beef (P_b), pork (P_p), and broilers (P_c); Y represents aggregate per capita consumer income; and the u's represent random disturbances that affect consumption of beef, pork, and broilers. Consumption and income figures are on a per capita basis so that population need not be included as a separate variable in the analysis.

If time series data on prices, quantities, and incomes are given, the statistical method used to estimate the coefficients in these structural demand relations depends on assumptions that are made regarding the type of functional relation that generates the observed data. As for many agricultural commodities, the total amount of meat consumed within a short period of time is largely dictated by the supplies available. Quantities placed in storage provide some leeway between production and consumption in the short run. However, variation in meat consumption closely parallels that in production. For this reason, production and consumption may be used almost interchangeably in a statistical analysis. As a result, quantities of each meat consumed per capita can be treated as given variables in the statistical analysis. This means that a given combination of production of beef, pork, and broilers results in a unique set of market prices that is simultaneously determined. Thus, if we are to estimate the coefficients in the demand equations (1) to (3), we must use a statistical method that allows for the joint determination of the three competing prices.

Equations of the sort discussed here are usually just identified. Hence, the reduced form method of fitting simultaneous equations can be used to estimate these coefficients.[3]

The computational procedure in this method can be summarized in three steps: (1) The variables in the structural demand equations are recombined in such a manner that each of the jointly determined variables (P_b, P_p, and P_c) is expressed separately as a function of all the given variables appearing in all the demand equations. (2) These equations, commonly known as reduced form equations, are fitted by the least squares method. (3) The coefficients in the structural demand equations are then algebraically derived from the estimates of the regression coefficients in the reduced form equation.

Besides serving as a basis for estimating demand elasticities, these reduced form (price estimating) equations are useful directly in price forecasting or studying the effect of income and supplies of meat on price. Because of the interest in the influence of meat supplies on price, considerable emphasis is given to the price-estimating equations (price-consumption relationships) in the discussion that follows.

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[3] Meinken, Rojko, and King used this procedure in "Measurement of Substitution in Demand from Time Series Data—A Synthesis of Three Approaches," *Journal of Farm Economics*, August 1956, pp. 711–735, in their study of beef and pork for the period 1928–53. A good presentation of the use of simultaneous equations in obtaining estimates of demand elasticities for a group of competing products when supplies of each are predetermined (given) is presented by Foote, R. J., *Analytical Tools for Studying Demand and Price Structures*, USDA Agriculture Handbook 146, August 1958, pp. 87–94. The basic equations fitted and the method of transforming the coefficients from the "reduced form" equations to obtain elasticity coefficients are presented in detail. Working in his *Demand for Meat*, Chicago, University of Chicago Press, 1954, used reduced form equations in his analyses and discussed them with other alternatives in some detail in Chapter 2, "The Measurement of Demand: General Considerations."

A second approach was also used to estimate the coefficients in the structural demand equations which considered consumption of each meat as the dependent variable. In other words, the structural equations were fitted directly by least squares. This may be justified in the following manner. In a period as short as 3 months, retailers establish selling prices and offer whatever supplies are needed to match consumer demands at that price. For example, cold storage holdings of pork often are equivalent to at least 1 month's total consumption. Hence stocks may be used to augment current production to satisfy demand requirements at the established price. Consumers are faced with given prices of pork, beef, and broilers and vary their purchases accordingly. In this respect consumption may be considered the dependent variable. Demand elasticities or the effect on consumption of changes in price and income may be computed directly from the regression equations when consumption is the dependent variable.

Both of these approaches were used in the analyses for the individual meats. Neither is clearly superior on logical grounds. Together they provide a more complete picture of interrelationships between price and consumption.

A further problem was encountered in deciding how to handle seasonal differences in the regression analyses. The simple scatter diagrams indicated that seasonal differences in demand appeared to exist for pork and broilers. These differences might be of two different types.

One is a difference of level analogous to a shift in demand. Instead of income or a competing meat, the shifter here is the season of the year. Such a shift or change in level indicates that the basic nature of the demand relationship does not change. In this case a seasonal shifter or variable might be incorporated into a single regression analysis and separate analyses for each of the seasons need not be run.

The second type of difference involves the nature of the relationship as well as its level. For example, in a simple, two-variable case the slope of the regression lines for price and quantity may differ widely in two periods. In this case a seasonal variable or shifter will not adequately reflect such a change.

Separate analyses for each of the two seasonal periods were run. In this way, differences either in level or structure were not assumed by the method of analysis. Likewise if either or both existed they could be distinguished.

Quarterly data were used in all the analyses. Data for the first and fourth quarters were used in the winter analysis while those for the second and third quarters were in the summer analysis. A set of demand elasticities was obtained by each of the two basic approaches to determine if differences in the nature of demand existed between summer and winter. The constant terms in the fitted regressions were compared to evaluate differences in level of demand.

The data used in the analysis were converted to logarithms. This action infers that the several elasticities of demand are constant over the range of prices and quantities considered. The price and income series were deflated by the BLS Consumer Price Index. The consumption variable used for each meat represents apparent domestic disappearance per capita. This is obtained by adjusting production for changes in storage stocks, imports, exports, and military uses. Hence consumption is primarily a function of production or supply. Six different combinations of variables were considered for each meat.[4] Those involving consumption and prices of each of the three meats and discretionary income [5] per capita are presented here.

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[4] For example, the following combinations of variables were used in the six regression analyses for pork using price as the dependent variable. The first analysis considered the pounds of pork, beef, and broilers consumed per capita, respectively, as the independent or predetermined variables. Then disposable income per capita was added as a fourth variable. Deflated discretionary income per capita replaced disposable income in the third analysis. Time replaced discretionary income in the fourth. In the fifth and sixth analyses each income variable, in turn, and time were considered along with the three consumption variables.

Disposable income per capita, time, and broiler consumption per capita were highly correlated. This intercorrelation complicated the interpretation of regression coefficients obtained from those analyses in which more than one of these variables were included. Hence, only the analyses involving discretionary income per capita and the price and consumption variables for the three meats are presented.

[5] A full explanation of the concept of discretionary income and procedures for its calculation are presented by Franklin, W. B., *Discretionary Income*, Technical Paper #6, National Industrial Conference Board, New York, 1958.

Table 1.—*Statistical price-consumption relationships for pork, quarterly data, United States, 1953–59*[1]

Period covered	Coefficient of multiple determination	Constant term	Effect on price of pork of a 1 percent change in—			
			Consumption per capita of:[2]			Deflated discretionary income per capita
			Pork	Beef	Broilers	
Winter	0.754	3.317	−0.872	−0.361	−0.136	----------
			(0.186)	(0.323)	(0.065)	----------
Summer	0.883	4.300	−1.521	−0.602	−0.031	----------
			(0.234)	(0.320)	(0.050)	----------
Winter	0.841	5.368	−0.554	−0.150	−0.015	−1.032
			(0.213)	(0.290)	(0.078)	(0.465)
Summer	0.886	4.564	−1.422	−0.548	−0.022	−0.169
			(0.326)	(0.354)	(0.056	(0.370)

[1] Analyses based on data expressed in logarithms. The general form of the regression is:

$$\log P_p = \log a + b_1 \log Q_p + b_2 \log Q_b + b_3 \log Q_c + b_4 \log Y.$$

The numbers in parentheses are the standard errors of the regression coefficients. Prices and income deflated by C.P.I.

[2] Production adjusted for changes in storage stocks, imports, exports, and military uses.

Results of Analyses for Pork

On the basis of the scatter diagrams and simple regression equations presented earlier, the greatest differences between comparable coefficients in the summer and winter equations should be expected for pork. This was the case.

Regressions with Price Dependent

The effect of changes in the quantities of pork, beef, and broilers available for consumption on the deflated retail price of pork for the years 1953–59 is presented in table 1. The regression coefficients, sometimes called "price flexibility" coefficients, indicate the percentage change in price associated with a one percent change in the quantity of each meat consumed, all other variables held constant.

Some important differences are evident. The price flexibility coefficients for pork consumption in the summer and winter equations were −1.52 and —0.87, respectively. This suggests that summer demand is price inelastic. On the other hand, winter demand appears somewhat price elastic. Both of these coefficients are clearly significant in terms of the usual statistical tests. Beef consumption appears to have a stronger effect on pork prices in the summer months than in the winter. In contrast, consumption of broilers appears to influence the price of pork only during the winter months.

When deflated discretionary income per capita was added as a variable the basic coefficients were similar, although differing in magnitude. Discretionary income, prepared by the National Industrial Conference Board, is based on the U.S. Department of Commerce figures on personal disposable income. It separates out major fixed commitments such as long- and short-term debt and interest payments, rent, and home-owner taxes. Essential expenses including minimum amounts for food and clothing are deducted as well. The remainder is the amount over which consumers currently have some discretion as to its use. This uncommitted income might well be a more important determinant of changes in meat purchases than disposable income itself; hence its consideration as a variable. Moreover, discretionary income was less closely correlated with the other independent variables included in this analysis than was disposable income.[6]

The greatest change resulting when discretionary income was included in the analysis was a reduction in the size of all the coefficients associated with the three consumption variables. The difference between the price flexibility coefficients for pork consumption were still large and striking. And the standard errors were relatively

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[6] The coefficient of determination obtained when disposable and discretionary income were correlated using quarterly series from 1948–1959 was 0.72.

TABLE 2.—*Estimates of elasticities of demand for pork from reduced form equations, quarterly data, United States, 1953–59*[1]

Period covered	Demand elasticities for pork with respect to—			
	Deflated retail prices of			Deflated discretionary income per capita
	Pork	Beef	Broilers	
Winter	−1. 274	+0. 327	+0. 398	--------
Summer	−0. 775	+0. 654	+0. 323	--------
Winter	−1. 829	+0. 242	+0. 127	−1. 849
Summer	−0. 708	+0. 693	+0. 355	+0. 198

[1] Elasticity coefficients were obtained algebraically from the price-consumption regressions for beef, pork, and broilers. (See tables 1 and 4.)

small. However, the seeming importance of broiler consumption as a competitor of pork in the winter was dissipated. The regression coefficient for income, however, was significantly different from zero and *negative*. Pork prices did fall during this period while incomes rose. But in economic terms it is more logical to state that pork prices fell despite rising incomes rather than because of them. In such a short-term analysis there may be good reason to question how reasonable it is to include income as a variable. Changes in the level of income over time undoubtedly shift demand. But to expect quarterly changes in income to have immediate effects on prices is another matter.

Demand Elasticities (Simultaneous Equations Approach)

Elasticity coefficients for pork, beef and broilers were obtained algebraically from the regression coefficients obtained in the reduced form equations (price-consumption relationships) for pork, broilers, and beef (see tables 1 and 4). These coefficients reflect the interaction of all the variables considered in each set of equivalent price-consumption relations. The elasticity estimates for pork are presented in table 2.

A comparison of direct price elasticities of demand for pork indicates that consumer response to price is greater during the winter months than in summer. When the income variable is included in the analysis, the direct price elasticity for the winter period is increased.

The cross elasticity coefficients carried the expected positive signs in both equations. In winter, a 1 percent change in the price of beef had less effect on pork consumption than in summer. If one assumes that the income elasticity coefficient for the winter equation has no economic significance and has in fact by its inclusion reduced the "true" effect of broiler prices, then an estimate of 0.3 to 0.4 as the cross elasticity for broilers seems justified.

Demand Elasticities (Single Equation Approach)

Estimates of demand elasticities were also calculated by least squares regression with consumption of pork as the dependent variable. These are presented in table 3. These elasticity coefficients differ from those in table 2 in a number of respects. Yet the same basic difference in demand between summer and winter is suggested. In contrast to the other method, standard errors of the regression coefficients are also presented.[7] The direct price elasticities for pork are smaller than those presented in table 2. However, they are more nearly of the magnitude that might have been expected before these analyses were run. The coefficients are significant in a statistical sense. Those in the winter equations approach unit elasticity. Those for summer are more clearly inelastic.

None of the cross elasticity figures were statistically significant, however. Yet their signs and relative size seem reasonable. Beef appears to be the stronger substitute for pork in summer. The broiler coefficients approach statistical significance in the winter analysis. Discretionary income was not a significant variable. It did not increase the multiple coefficient of determination when added to the analysis. The income coefficients generated were not significantly different from zero.

General Conclusions

Each of the regression analyses indicated definite differences in the price-consumption relationships for pork in the summer and winter months. Moreover, the difference appeared to be one of

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[7] Unfortunately, it is computationally tedious and difficult to obtain standard errors of demand elasticities derived from reduced form equations. For this reason, it was felt that sufficient clues would be obtained from the standard errors in the original regression equations.

Table 3.—*Direct estimates of elasticities for pork, quarterly data, United States, 1953–59*[1]

Period covered	Coefficient of multiple determination	Constant term	Demand elasticities for pork with respect to—			
			Deflated retail prices of:			Deflated discretionary income per capita
			Pork	Beef	Broilers	
1 Winter	0.658	1.714	−0.844	+0.326	+0.226	
			(0.199)	(0.306)	(0.135)	
2 Summer	0.856	1.565	−0.543	+0.220	+0.086	
			(0.086)	(0.147)	(0.075)	
1 Winter	0.668	2.918	−0.955	+0.292	+0.189	−0.332
			(0.300)	(0.325)	(0.158)	(0.650)
2 Summer	0.865	0.966	−0.491	+0.246	+0.106	+0.159
			(0.110)	(0.153)	(0.081)	(0.201)

[1] Analyses based on data expressed in logarithms. The general form of the least squares regression in these analyses is:

$$\log Q_p = \log a + b_1 \log P_p + b_2 \log P_b + b_3 \log P_c + b_4 \log Y.$$

The numbers in parentheses are the standard errors of the regression coefficients. Prices and income deflated by C.P.I.

structure as well as level. Direct price elasticities of about −0.9 to −1.2 in winter and −0.55 to −0.75 in summer were suggested. The cross elasticity figures obtained were not statistically significant. However, beef appeared to be the stronger substitute for pork in summer than in winter. Broilers apparently were important only in the winter months. For the recent short period of relatively high incomes, the income elasticity figures appeared to have no economic significance.

Results of Analyses for Broilers

The same type of regression analyses made for pork were carried out for broilers. The simple scatter diagrams comparing data on retail prices and consumption per capita indicated that summer demand was stronger than winter demand. Outdoor uses for chicken in summer, together with the stronger competition from turkey and other poultry during the winter months, support this hypothesis.

Regressions with Price Dependent

A comparison of regression coefficients obtained when the deflated retail price of broilers was related to the two sets of variables is shown in table 4. A few general conclusions stand out after studying these coefficients.

First, broiler consumption accounts for most of the variation in broiler prices whether full year, winter, or summer periods are considered. The simple r's are 0.65, 0.85, and 0.90, respectively. The respective partial correlation coefficients in the various multiple regression analyses bear this out even more strongly.

Second, the price flexibility coefficient for broiler consumption is the only significant variable in both of the summer equations. In winter, the coefficients for pork, beef, and income are all more important. This suggests that the relatively high level of broiler consumption during the summer months is not much affected by changes in the prices of other meats. In the winter this competition is more important. Pork appears to be the more important substitute. But the coefficients for beef are also large and significant in one equation.

Third, discretionary income appears to be a significant variable in the winter months. This apparent significance may result, however, from the close association between income and broiler consumption. On the other hand since price has steadily moved downward while income moved upward and the income coefficient still remains positive and reasonable, the statistical result cannot be ignored.

Demand Elasticities (Simultaneous Equations Approach)

Elasticity estimates were obtained from the reduced form regression coefficients in the same

Table 4.—*Statistical price-consumption relationships for broilers, quarterly data, United States, 1953–59* [1]

Period covered	Coefficient of multiple determination	Constant term	Effect on price of broilers of a 1 percent change in—			
			Consumption per capita of: [2]			Deflated discretionary income per capita
			Broilers	Beef	Pork	
Winter	0.916	2.822	−0.577 (0.061)	−0.348 (0.303)	−0.338 (0.175)	------------
Summer	0.911	1.838	−0.568 (0.066)	+0.329 (0.416)	−0.226 (0.305)	------------
Winter	0.954	0.638	−0.707 (0.067)	−0.514 (0.249)	−0.678 (0.183)	+1.100 (0.399)
Summer	0.919	1.156	−0.593 (0.071)	+0.188 (0.445)	−0.480 (0.409)	+0.436 (0.464)

[1] Analyses based on data expressed in logarithms. The general form of the regression is:

$$\log P_c = \log a + b_1 \log Q_c + b_2 \log Q_b + b_3 \log Q_p + b_4 \log Y.$$

The numbers in parentheses are the standard errors of the regression coefficients. Prices and income deflated by C.P.I.

[2] Production adjusted for changes in storage stocks, imports, exports, and military uses.

manner as those for pork. The direct price elasticities were higher in summer than in winter (table 5). In both cases, they were somewhat larger than expected. The addition of income in the winter analysis had a definite effect in dropping the direct price elasticity figure from −1.8 to −1.25. Income was a significant variable only in the winter analysis in the reduced form equations.

The cross-elasticity figures in the winter equations are more credible than those in summer. The lack of significance in the price flexibility coefficients in the reduced form equations for summer pointed to the likelihood of this kind of result. The importance of pork as a substitute for broilers in winter is made clear by both of the cross- elasticity figures. Beef is also important although less so than pork.

Because the addition of discretionary income had such a major effect on all of the coefficients in the winter equations there is good reason to question whether the absolute values have direct meaning in a predictive sense. They do establish the nature of the difference which appears to exist between summer and winter demand. The importance of the elasticity figures themselves is more relative than absolute.

Demand Elasticities (Single Equation Approach)

Regression analyses where prices are treated as the independent variables, can be justified more easily for broilers than the other two meats in terms of the production cycle. It takes only 9 weeks to grow a chick into a broiler ready for slaughter. Hence response to shifts in demand can be much more rapid. Stocks of broilers in cold storage are usually small reflecting the ability of the industry to move rapidly. Consumption per capita is less a predetermined variable than is the case for beef or even pork.

Table 5.—*Estimates of elasticities of demand for broilers from reduced form equations, quarterly data, United States, 1953–59* [1]

Period covered	Demand elasticities for broilers with respect to—			
	Deflated retail prices of—			Deflated discretionary income per capita
	Broilers	Beef	Pork	
Winter	−1.793	+0.369	+0.725	--------
Summer	−2.290	−1.181	+0.466	--------
Winter	−1.256	+0.538	+1.825	+3.663
Summer	−2.239	−1.119	+0.571	+0.311

[1] Elasticity coefficients were obtained algebraically from the price-consumption regressions for beef, pork, and broilers. (See tables 1 and 4.)

The elasticity coefficients themselves, in table 6, do not support the notion that summer demand

TABLE 6.—*Direct estimates of elasticities for broilers, quarterly data, United States, 1953–59* [1]

Period covered	Coefficient of multiple determination	Constant term	Demand elasticities for broilers with respect to—			
			Deflated retail prices of:			Deflated discretionary income per capita
			Broilers	Beef	Pork	
Winter	0.869	2.627	−1.534 (0.244)	+0.024 (0.555)	+0.230 (0.361)	-----------
Summer	0.914	2.275	−1.324 (0.277)	+0.582 (0.541)	−0.286 (0.317)	-----------
Winter	0.917	5.227	−1.290 (0.232)	+0.244 (0.477)	+0.952 (0.440)	+2.164 (0.953)
Summer	0.933	1.814	−1.189 (0.272)	+0.761 (0.516)	+0.073 (0.370)	+1.085 (0.678)

[1] The general form of the least squares regression in these analyses is:

$$\log Q_c = \log a + b_1 \log P_c + b_2 \log P_b + b_3 \log P_p + b_4 \log Y.$$

The numbers in parentheses are the standard errors of the regression coefficients. Prices and income deflated by C. P. I.

is quite different from that in winter. When the three retail price series were related to broiler consumption only the direct price-elasticity coefficients were statistically significant in both the summer and winter analyses. While both of these coefficients were greater than −1.0 they were not as large as those in table 5, obtained from the simultaneous equations approach. The cross-elasticity figures which seemed quite logical in the earlier winter equations were not significant using this regression model.

When discretionary income was included in the analysis the direct price elasticities were reduced somewhat although they were still above −1.0. Pork now appeared to be a direct substitute in winter for broilers. Its elasticity coefficient was statistically significant as well. Beef appeared to be an important substitute in summer although this was not as clearly established in a statistical sense. Both income coefficients were large and the signs were logical in an economic sense. Again, however, the length of time involved raises questions as to their meaningfulness.

General Conclusions

The two methods of analysis give conflicting evidence on seasonal differences in demand for broilers. One might try to rationalize these results and simply choose those which support most closely the original hypothesis posed. In point of fact, the size of the elasticity coefficients obtained from the single equation analyses most closely approximate original expectations. Those generated from the reduced form equations show the expected differences between summer and winter but are much larger than seem reasonable for prediction. The original hypothesis was not disproved. But neither was it strongly supported.

Results of Analyses for Beef

Regression analyses for beef were made for the 12-year period, 1948–59. Differences between quarters in the price-consumption relationships were difficult to observe in the simple scatter diagrams. There was about as much reason to combine the first two and the last two quarters of the year, as the first with the fourth, and the second with the third. Because pork and broilers did fit the second pattern quite closely, beef was studied in a similar manner.

Regressions With Price Dependent

Results from regression analyses where price was considered as the dependent variable are shown in table 7. All of the signs for the consumption variable were expected to be negative, but they were not. In every case the coefficient for broiler consumption had a positive sign. Broiler consumption did increase markedly during the period. Likewise there was an upward trend in beef prices once the level of beef consumption was taken into consideration. But the

Table 7.—*Statistical price-consumption relationships for beef, quarterly data, United States, 1948–59* [1]

Period covered	Coefficient of multiple determination	Constant term	Effect on price of beef of a 1-percent change in—				
			Consumption per capita of: [2]			Deflated discretionary income per capita	Time
			Beef	Pork	Broilers		
Winter	0. 842	2. 664	−0. 854 (0. 106)	+0. 142 (0. 137)	+0. 100 (0. 032)		
Summer	0. 806	3. 175	−0. 930 (0. 163)	−0. 195 (0. 261)	+0. 094 (0. 047)		
Winter	0. 845	2. 659	−0. 855 (0. 124)	+0. 142 (0. 160)	+0. 100 (0. 038)	+0. 003 (0. 280)	
Summer	0. 815	2. 656	−1. 011 (0. 186)	−0. 308 (0. 289)	+0. 087 (0. 048)	+0. 282 (0. 305)	
Winter	0. 824	2. 691	−0. 807 (0. 109)	+0. 073 (0. 146)			+0. 037 (0. 015)
Summer	0. 778	2. 839	−0. 787 (0. 163)	−0. 045 (0. 267)			+0. 022 (0. 024)

[1] Analyses based on data expressed in logarithms. The general form of the regression is:

$$\log P_b = \log a + b_1 \log Q_b + b_2 \log Q_p + b_3 \log Q_o + b_4 \log Y + b_5 \log T.$$

The numbers in parentheses are the standard errors of the regression coefficients. Prices and income deflated by C.P.I.

[2] Production adjusted for changes in storage stocks, imports, exports, and military uses.

upward rise in beef prices did not result *because* of increased broiler consumption *but in spite of it.* Income also was increasing during this period. The addition of discretionary income as a variable did not separate out this strong influence. Because of these related trends, it is reasonable to assume that the "significant" coefficients associated with broiler consumption in fact have no economic meaning.

Another analysis was run, eliminating broiler consumption per capita as a variable and introducing time to take account of trend. These results are also included in table 7. The price flexibility coefficients for beef consumption in every case are highly significant. They all suggest an elastic demand for beef with the winter coefficient, if anything, the larger of the two. The most elastic coefficients develop when broiler consumption is eliminated as a variable. But important differences between the summer and winter coefficients cannot be demonstrated.

Pork consumption does not have a significant effect on beef prices in either season. A study of the data suggests that when pork consumption is low beef prices may shift upward, but the reverse does not seem to occur. Beef generally has fared better than pork during the postwar years. These results suggest that pork has not been a very strong competitor for the beef market in either winter or summer.

Demand Elasticities (Simultaneous Equations Approach, 1953–59)

Estimates of demand elasticities derived from reduced form equations for beef for the period

Table 8.—*Estimates of elasticities of demand for beef from reduced form equations, quarterly data, United States, 1953–59* [1]

Period covered	Demand elasticities for beef with respect to—			
	Deflated retail prices of			Deflated discretionary income per capita
	Beef	Pork	Broilers	
Winter	−0. 929	+0. 036	−0. 286	
Summer	−1. 592	+0. 272	−0. 696	
Winter	−0. 948	−0. 088	−0. 346	−0. 411
Summer	−1. 756	−0. 009	−0. 832	−0. 834

[1] Elasticity coefficients were obtained algebraically from the price-consumption regressions for beef, pork and broilers. (See tables 1 and 4.)

Table 9.—*Direct estimates of elasticity coefficients for beef, quarterly data, United States, 1948–59*[1]

Period covered	Coefficient of multiple determination	Constant term	Demand elasticities for beef with respect to—			
			Deflated retail prices of:			Deflated discretionary income per capita
			Beef	Pork	Broilers	
Winter	0.930	3.207	−0.882 (0.088)	+0.160 (0.121)	−0.373 (0.059)	------------
Summer	0.912	3.096	−0.867 (0.098)	+0.274 (0.144)	−0.434 (0.079)	------------
Winter	0.939	1.898	−0.850 (0.086)	+0.253 (0.127)	−0.330 (0.061)	+0.380 (0.216)
Summer	0.922	1.806	−0.841 (0.096)	+0.350 (0.147)	−0.386 (0.082)	+0.384 (0.243)
Winter	0.847	0.606	−0.944 (0.133)	+0.055 (0.193)	------------ ------------	+0.844 (0.314)
Summer	0.830	0.728	−0.972 (0.136)	+0.083 (0.201)	------------ ------------	+0.803 (0.334)

[1] The general form of the least squares regression in these analyses is:

$$\log Q_b = \log a + b_1 \log P_b + b_2 \log P_p + b_3 \log P_o + b_4 \log Y.$$

The numbers in parentheses are the standard errors of the regression coefficients. Prices and income deflated by C.P.I.

1953–59 are presented in table 8. They apply to only 7 years in contrast to the 12 years covered by the regression equations presented in tables 7 and 9. They are of primary interest with respect to differences in price elasticities suggested for beef between summer and winter.

In these equations summer demand is more elastic than winter demand. The price elasticity figures for beef in winter approach −1.0. In summer they are considerably larger. The large negative cross elasticities suggested for broiler prices, however, temper any enthusiasm one might have for these large differences. Likewise, the income elasticity figures are negative contrary to logic.

Demand Elasticities (Single Equation Approach)

Estimates of elasticities for the 12-year period (1948–59) from the regressions using consumption as the dependent variable are shown in table 9. Very little difference was demonstrated between the coefficients in the summer and winter equations. The direct-price elasticities for beef all ranged between −0.84 and −0.88 when broiler consumption was included in the analysis. Because all of the cross elasticities for broilers were negative and statistically significant as well, another analysis in which broiler prices were not included was run. In this case the direct-price elasticities for beef approached −1.0. The summer elasticity figure was slightly larger than that for winter. The difference cannot be considered significant, however.

It is also interesting to note the other effects resulting from the dropping of broiler prices from the analysis. Whereas the price of pork appeared as an important variable in the first two analyses in both summer and winter, it was not so when broilers were excluded. Instead, the income coefficient became more important. Although the corresponding coefficients are not shown in table 9 the same result occurred when time was substituted for discretionary income in the regression equation. The coefficients for time increased in size while those for pork decreased. The results from these different combinations would seem to suggest that income probably is important in the case of beef, but because of related trends in income and broiler consumption, the precise influence cannot be ascertained.

General Conclusions

These regression analyses suggest that seasonal differences in demand for beef are smaller than those for pork and broilers. In fact, the statistical evidence of a real difference in either level or structure is indeed meager. The elasticities generated from the reduced form equations for the 7-year period, 1953-59, were the only ones that suggested that a difference might exist, but the coefficients other than those for beef prices in these equations were subject to question.

Summary

This paper has investigated the likelihood that real differences exist in consumer demand for beef, pork, and broilers between seasons within a year. Seasonal movements in retail prices for beef and pork cannot be explained by changes in supply or consumption alone. This indicates that the demand for each meat is not stable throughout the year but differs seasonally in a definite pattern.

Simply plotting retail prices against per capita consumption data on a quarterly basis indicates the general nature of these differences. The greatest difference is noted for pork. Winter demand is much stronger than summer demand. On the other hand, the demand for broilers was stronger in summer. Differences for beef were less obvious. Both prices and consumption, however, were generally above average during the third quarter.

Regression analyses for each of the meats were run using quarterly data and separating data for the first and fourth quarters from those in the second and third quarters. Short run elasticity coefficients were obtained for pork and broilers using time series data for 1953–59. Similar estimates were made for beef over the 12-year period, 1948–59. The coefficients obtained generally supported the original hypotheses suggested by the simple scatter diagrams. All of the analyses showed a major difference in the structure of demand for pork between summer and winter. Direct price elasticities of -0.9 to -1.2 for winter and -0.55 to -0.75 for summer were indicated.

Like most studies, this one suggests that further effort might be profitable in more clearly determining the actual time span in which seasonal differences exist. The division of time into summer and winter was somewhat arbitrary. In the case of beef, inclusion of data for the second quarter with those for the third obscured some of the differences that appeared to exist originally.

Recognition of seasonal differences in demand should be of particular interest to specialized, year-round producers of hogs or broilers, as well as packers and processors. An individual must always make his own production decisions on the basis of what appears to be of greatest advantage to him. This analysis suggests some clear disadvantages to producers as a group from marketing a much higher proportion of the total supply of pork during the summer months, even though farm prices for pork historically have been highest during July, August, and September. Small changes in production at this time can result in major price breaks. In contrast, broiler producers as a group appear likely to profit most years by planning to reach maximum production during the summer. Again, however, an individual will profit most by correctly anticipating what other producers will do, then acting accordingly.

Retail Value and Farm Income by Commodity Groups

By Harry C. Norcross

This article analyzes 1955 data on gross farm income, production expenditures, net income, and marketing charges, by major commodity groups. This piece of research is largely a byproduct of the Agricultural Industrial Relations Study of 1955 which provided some insights into the impact of purchases and sales of the farm economy. The framework of analysis is the same as that used in an earlier article published in the January 1952 issue of Agricultural Economics Research, *"Some Relationships Between Agriculture and the General Economy," by Karl A. Fox and the author of the present paper. In the earlier article, data for the year 1947 were analyzed. The analysis in the article that follows shows the way each of seven major groups of expenditures is distributed among the commodity categories, and the percentage use that each commodity group makes of each expenditure group in its total production expenses.*

BASIC DATA for this study were obtained largely from materials prepared in the Agricultural Marketing Service for other purposes—in many instances, a great deal of adaptation was necessary. Information from the 1955 Agricultural-Industrial Relations Study was used as a basis for the breakdown of the production expenditures in section 4 of table 1.

It was used also in arriving at some of the cash receipt items in section 2 of table 1. Information on food marketing charges in the first section, and that for nonfood products and byproducts for domestic use in the second section, was adapted from data prepared for the National Farm-Retail Food Marketing Bill. Most of the remaining information on cash farm income was based on commodity supply and distribution statistics worked up for use in the *National Food Situation*, issued by the Agricultural Marketing Service. The information on gross farm income and its breakdown in the third section was derived from estimates regularly prepared for publication in the *Farm Income Situation*, issued by the Agricultural Marketing Service. The new figures are based on the informed judgment of competent analysts and on other data and procedures that are commonly used for the purpose. The data are considered to be reasonably accurate estimates.

Net income of farmers reflects changes in the final demand for farm products and in production costs. Any attempt to allocate marketing charges or production expenses where a single input relates to joint products or different products is difficult conceptually and empirically. Allocations of these inputs by commodity groups are frequently based on fragmentary data and usually require considerable judgment. Thus, net farm income by commodity group is necessarily a rough approximation.

Farmers' cash receipts for major groups of commodities are estimated regularly by the Agricultural Marketing Service. For some analytical purposes, it is helpful to know something of the impact of changes in marketing charges and production expenses on farmers' net income from various products. These approximations for some nine commodity groups are shown in table 1.

The estimates show retail value of farm food products, and their equivalent farm value by major commodity groups. They show cash farm income broken down on the basis of the type of user, both for food and nonfood. Gross farm income and production expenditures are also presented by principal items and realized net income of farm operators is derived for the nine major product groups. The table is a breakdown of estimates, by major commodity group of total production expenditures, cash receipts and gross and net farm income as published in the *Farm Income Situation;* estimates of food marketing charges as reported for the National Farm-Retail Food Marketing Bill in the *Marketing and Transportation Situation* issued by the Agricultural Marketing Service; and estimates of food sales and distribution upon which are based the consumption estimates published in the *National Food Situation* (table 2).

Production Expenditures

Estimates of production expenditures by commodity groups shown in the lower part of table

TABLE 1.—*Marketing charges, production expenditures, and sources of gross and net farm income, by commodity groups, United States, 1955* [1]

Item	Meat animals (1)	Dairy products (2)	Poultry and eggs (3)	Fruits and vegetables (4)	Food grains (5)	Feed crops (6)	Cotton and cottonseed (7)	Tobacco (8)	Miscellaneous (9)	All commodities (10)
	Billions of dollars	*Billions of dollars*	*Billions of dollars*	*Billions of dollars*	*Billions of dollars*	*Billions of dollars*	*Billions of dollars*	*Billions of dollars*	*Billions of dollars*	*Billions of dollars*
(1) Food marketing charges:										
Retail value of farm food products	12. 87	8. 77	4. 43	9. 94	[2] 6. 48	-------	-------	-------	[3] [4] 3. 75	[4] 46. 24
Food marketing charges	6. 17	4. 83	1. 49	7. 37	5. 18	-------	-------	-------	2. 92	27. 96
Equivalent farm value	6. 70	3. 94	2. 94	2. 57	[2] 1. 30	-------	-------	-------	[3] . 83	18. 28
Sources of:										
(2) Cash farm income: [5]										
Sales for food used by domestic civilians [6]	6. 73	4. 01	3. 02	2. 63	. 89	. 16	. 13	-------	. 71	18. 28
Food use by Armed Forces	. 19	. 13	. 07	. 24	. 02	-------	-------	-------	-------	. 65
Nonfood and by-products for domestic use	. 22	-------	. 22	-------	. 68	. 97	2. 06	. 90	[7] 1. 69	6. 74
Exports and shipments	. 02	-------	. 02	. 13	. 46	. 15	. 41	. 32	. 18	1. 69
Interfarm sales	1. 19	-------	-------	. 01	. 03	1. 31	-------	-------	. 19	2. 73
Balancing item [7]	—. 15	+. 08	—. 13	—. 18	—. 09	—. 05	—. 03	-------	-------	—. 55
Cash receipts from farm marketings	8. 20	4. 22	3. 20	2. 83	1. 99	2. 54	2. 57	1. 22	2. 77	29. 54
(3) Gross farm income:										
Cash receipts from farm marketings	8. 20	4. 22	3. 20	2. 83	1. 99	2. 54	2. 57	1. 22	2. 77	29. 54
Home consumption	. 35	. 49	. 26	. 47	-------	. 01	-------	-------	. 12	1. 70
Rental value of dwellings	. 30	. 35	. 13	. 16	. 16	. 15	. 25	. 12	. 12	1. 74
Gross farm income [8]	8. 85	5. 06	3. 59	3. 46	2. 15	2. 70	2. 82	1. 34	3. 01	32. 98
(4) Production expenditures: [9]										
Purchased livestock	1. 19	-------	. 34	-------	-------	-------	-------	-------	-------	1. 53
Purchased feed	1. 06	. 89	1. 66	. 01	. 02	. 02	. 03	. 02	. 02	3. 73
Hired labor	. 52	. 47	. 08	. 53	. 06	. 13	. 59	. 16	. 20	2. 74
Operation of motor vehicles	. 66	. 47	. 20	. 23	. 27	. 35	. 21	. 10	. 28	2. 77
Miscellaneous goods and services	1. 05	. 70	. 27	. 61	. 34	. 44	. 55	. 17	. 32	4. 45
Taxes, interest, net rent	. 78	. 47	. 18	. 16	. 30	. 24	. 21	. 08	. 21	2. 63
Depreciation	. 70	. 92	. 28	. 26	. 30	. 47	. 20	. 12	. 50	3. 75
Production expenditures	5. 96	3. 92	3. 01	1. 80	1. 29	1. 65	1. 79	. 65	1. 53	21. 60
(5) Realized net income of farm operators:										
Gross farm income	8. 85	5. 06	3. 59	3. 46	2. 15	2. 70	2. 82	1. 34	3. 01	32. 98
Production expenditures	5. 96	3. 92	3. 01	1. 80	1. 29	1. 65	1. 79	. 65	1. 53	21. 60
Realized net income of farm operators [8] [10]	2. 89	1. 14	. 58	1. 66	. 86	1. 05	1. 03	. 69	1. 48	11. 38

[1] Farm income and expenditure data as shown above differ slightly from the latest revisions.

[2] Bakery and cereal products. Farm value includes value of other bakery-product ingredients as well as value of flour, cornmeal, and so on.

[3] Food only. Includes some cottonseed oil and corn products (wet process) in addition to products classified as "Miscellaneous" in sections 2 and 3 of this table.

[4] Includes $0.03 billion of marketing taxes, mainly on sugar.

[5] Figures in section 2 are equivalent farm values of the respective commodity flows.

[6] Same as row above, except that farm values of bakery and cereal products and miscellaneous foods have been redistributed according to farm-product categories of sections 2 and 3.

[7] Includes changes in nonfarm stocks, statistical discrepancies, rounding errors, and so on.

[8] Excluding Government payments.

[9] Cash expenditures for current operations, plus allowance for depreciation.

[10] Includes returns for the labor of farm operators and unpaid family workers, as well as for management and investment.

1 were obtained by breaking down the 1955 published estimates for each expenditure item. The breakdown was made first on the basis of all products produced for sale or for further production. Adjustments were then made to allow for products used for animal consumption. Proportional shares of the expenditures in each of the feed producing sectors were assigned to the respective livestock sectors.

The methods used in making the original expenditure allocations varied greatly. In cases where the expenditure applied to only one commodity group there was little question about the allocation. Such expenditures included purchased livestock and some of the smaller miscellaneous items like cotton ginning, miscellaneous dairy supplies, milk hauling, and grazing fees. Since they required no breakdown other than what was readily available from the national estimates, they were assigned at once to meat animals, cotton, or dairy products, as the case might be.

Most of the expenditures, however, were common to many or all groups. In many of these cases, the breakdown for the allocations among the commodity sectors were based on the results of the 1955 Agricultural Industrial Relations Study. Part of such costs originated in the nonfarm area of the economy. Some expenditure items represented inputs into agriculture from several different industries.

TABLE 2.—*Cash farm income by sources, United States, 1955*

Source	Cash farm income	
	Amount	Percentage of total
	Billions of dollars	*Percent*
Total cash receipts from farm marketings	29. 54	100. 0
Sales for food use by domestic civilians	18. 28	61. 9
Food use by Armed Forces	. 65	2. 2
Nonfood products and byproducts for domestic use	6. 74	22. 8
Interfarm sales	2. 73	9. 2
Exports and shipments	1. 69	5. 7
Balancing item	—. 55	−1. 8

Much of the input distributing had already been done in the development of the Agricultural Industrial Relations Study. Some regrouping had to be done, however, to adjust from a 17-sector breakdown for the 1955 study to the 9 sectors used in this study. In making the sector distributions, information concerning purchases and sales by agriculture and industry were generally used. Such data were available in the 1955 Farm Expenditure Study, the 1954 Census of Agriculture, the 1954 Census of Manufactures, and a great deal of miscellaneous but authoritative information was obtained from such sources as agricultural bulletins, trade journals, and transportation and employment publications.

For example, in breaking down the national expenditure for fertilizer it was found that the contributing industries to the final product used were inorganic chemicals; phosphate rock; potash, soda, and borate minerals; and mixed fertilizers. By the use of such information as *Consumption of Fertilizers and Primary Plant Nutrients in the*

TABLE 3.—*Percentage distribution of major production expenditures by commodity groups, United States, 1955*

Commodity groups	Expenditures by farm operators for—						
	Total production expenditures (1)	Purchased feed (2)	Operation of motor vehicles (3)	Depreciation on vehicles, equipment, buildings (4)	Hired labor (5)	Taxes, interest, and net rent to nonfarm landlords (6)	Miscellaneous (including purchased livestock) (7)
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
All commodities	100. 0	100. 0	100. 0	100. 0	100. 0	100. 0	100. 0
Meat animals	27. 6	28. 4	23. 9	18. 7	18. 9	29. 7	37. 5
Dairy products	18. 1	23. 7	16. 8	24. 5	17. 2	17. 9	11. 7
Poultry and eggs	13. 9	44. 5	7. 3	7. 5	3. 0	6. 8	10. 0
Fruits and vegetables	8. 3	. 4	8. 3	6. 9	19. 4	6. 2	10. 2
Food grains	6. 0	. 4	9. 7	8. 0	2. 0	11. 5	5. 8
Feed crops	7. 7	. 7	12. 5	12. 4	4. 8	9. 2	7. 4
Cotton and cottonseed	8. 3	. 9	7. 6	5. 3	21. 5	7. 9	9. 3
Tobacco	3. 0	. 5	3. 8	3. 2	6. 1	3. 0	2. 7
Miscellaneous	7. 1	. 5	10. 1	13. 5	7. 1	7. 8	5. 4

Table 4.—*Percentage distribution of production expenditures for major commodity groups, United States, 1955*

Commodity groups	Expenditures by farm operators for—						
	Total production expenditures (1)	Purchased feed (2)	Operation of motor vehicles (3)	Depreciation on vehicles equipment, buildings (4)	Hired labor (5)	Taxes, interest, and net rent to nonfarm landlords (6)	Miscellaneous (including purchased livestock) (7)
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
All commodities	100. 0	17. 3	12. 8	17. 4	12. 7	12. 2	27. 6
Meat animals	100. 0	17. 8	11. 1	11. 7	8. 7	13. 1	37. 6
Dairy products	100. 0	22. 6	11. 9	23. 5	12. 0	12. 1	17. 9
Poultry and eggs	100. 0	55. 2	6. 7	9. 4	2. 8	6. 0	19. 9
Fruits and vegetables	100. 0	. 8	12. 7	14. 3	29. 5	9. 0	33. 7
Food grains	100. 0	1. 2	21. 0	23. 4	4. 2	23. 6	26. 6
Feed crops	100. 0	1. 5	20. 9	28. 1	7. 9	14. 7	26. 9
Cotton and cottonseed	100. 0	1. 9	11. 7	11. 0	32. 8	11. 6	31. 0
Tobacco	100. 0	2. 6	16. 3	18. 5	25. 5	12. 3	24. 8
Miscellaneous	100. 0	1. 3	18. 3	33. 2	12. 7	13. 4	21. 1

United States, published by Agricultural Research Service in September 1960, and per-ton prices obtained from *Agricultural Prices*, issued monthly by Agricultural Marketing Service, the retail values of the various fertilizing nutrient carriers (ammonium nitrate, ammonium sulfate, sodium nitrate, etc.) were derived. Those values were then cumulated for the inputs from each industry—inorganic chemicals, phosphate rock, and so on. The industry input values were assigned to the commodity groups on the basis of percentages developed by means of information on fertilizer applications to different crops provided in *Fertilizer Used on Crops and Pasture in the United States, 1954 Estimates*, released by the Agricultural Research Service, August 1957 (table 4).

National expenditures for such general items as farm mortgage interest, electricity, short-term interest, fire and wind insurance, and telephone fees were broken down into commodity categories by first allocating expenditures by major type of farms, using the type of farm data provided by the 1955 Farmers' Expenditure Study. These allocations of expenditures by type of farm were then broken down into the nine commodity sectors on the basis of the distribution of sales or value of production of these commodity groups.

The form taken by the expenditure data was determined by the commodity group breakdown of cash receipts ordinarily used in analyzing and reporting farm income. The expenditures allocated to each commodity group or sector refer only to those incurred in the production of the products sold. For example, the production expenditures assigned to feed crops include only the costs for producing corn, oats, barley, grain sorghums, or hay sold by farmers. Expenditures for production of feed fed on farms where grown are assigned to the livestock that consume the feeds rather than to feed crops, food grains, and other feed-producing sectors. Such homegrown feeds include some of the dairy products, food grains, feed crops, vegetables, oil-bearing crops, legume and grass seeds, and some miscellaneous crops. The adjustments are based largely on data furnished by the 1955 Agricultural Industrial Relations Study, which show the value of the flow of products from one agricultural sector to another. The expenditures for these transferable items are valued at slightly more than $4 billion.

By far the largest part of this adjustment results from the transfer of feed crops to livestock, particularly to meat and dairy animals. Much smaller reallocations were due to transfers of food grains to meat animals and poultry and eggs, the transfer of small quantities of feed crops to all

TABLE 5.—*Farm food products: Percentage distribution of retail value, total marketing bill, farm value, and the ratio of farm to retail value by major commodity groups, United States, 1955*

Commodity group	Retail value (1)	Total marketing bill (2)	Farm value (3)	Ratio farm to retail value (4)
	Percent	*Percent*	*Percent*	*Percent*
All food products	100	100	100	40
Meat products	28	22	36	52
Dairy products	19	17	22	45
Poultry and eggs	10	5	16	66
Fruits and vegetables	21	26	14	26
Bakery and cereal products	14	19	7	20
Miscellaneous	8	11	5	22

groups for feeding work stock, legume and grass seeds to the crop groups for grass and cover crops, vegetables for feed to meat animals, and milk to meat animals for calf feeding. Because of these adjustments, expenditures formerly assigned to feed crops were reduced by $4 billion; those to the miscellaneous group, $50 million; and food grains, $8 million. Meat animals, with an increase of nearly $2 billion, received the largest addition to its expenditures, dairy products second with $1.5 billion. Poultry and eggs, cotton, fruits and vegetables, and tobacco followed at much lower levels.

The breakdown in table 1 is based on groups of commodities instead of types of farming, and cash receipts as well as expenditures assigned to each sector are those which apply to the commodities included in the group only. As a result, there is no provision for allocating to any given sector the receipts and costs of joint or supplementary enterprises unless their products are included in that particular commodity group. For example, any income from or expenditures because of the sale of dairy animals for slaughter are transferred to meat animals, as the dairy category includes only milk and butterfat.

Marketing Margins

The distribution of marketing margins by commodity groups is shown in section 1 of table 1, along with the retail-store value of farm food products and the equivalent farm value. The estimates of the retail-store value of farm-produced foods were made by multiplying retail prices obtained from the Bureau of Labor Statistics by utilization of food commodities estimated by the Agricultural Marketing Service and published in annual supplements to the bulletin, *Consumption of Food in the United States, 1909–52*, Agriculture Handbook No. 62. Average monthly farm prices obtained from *Agricultural Prices*, published by the Agricultural Marketing Service, were multiplied by quantities of farm-produced foods to arrive at the equivalent farm values. The food-marketing charges were then derived by subtracting the equivalent farm values from the retail-store value of farm food products (table 5).

Comparison of 1955 with 1947

In general, the type of data used and the methods employed in handling them were similar in 1955 to those used in the 1947 study. Comparability was maintained so far as possible, but there were a few important exceptions. The material compiled in connection with the 1955 Agricultural-Industrial Relations Study provided greater precision in the methods used in working up some of the expenditure statistics in section 4 of table 1, and the statistics shown in tables 3 and 4. This was true particularly in computing the adjustments in expenditure data such as home-grown feed, seeds, and so on, transferred from the producing to the consuming sectors. In the earlier study, this adjustment was made for expenditures relating to the transfer of feed crops alone. The availability of more information for 1955 probably gave the recent data a little greater reliability. But, as shown previously, the total of all expenditure transfers except feed crops was small and the difference made by including them was not substantial.

The reason why there was so little change in gross income for all commodities from 1947 to 1955 was that prices received by farmers averaged 16 percent lower in 1955 than in 1947, while a rise of 17 percent in the volume of marketings was about offsetting (table 6).

TABLE 6.—*Gross farm income by commodities, 1947 and 1955*

	1947 [1]	1955 [2]	Percent 1955 of 1947
	Billions of dollars	*Billions of dollars*	
All commodities	34. 03	32. 98	96. 9
Meat animals	10. 26	8. 85	86. 3
Dairy products	5. 08	5. 06	99. 6
Poultry and eggs	3. 50	3. 59	102. 6
Fruits and vegetables	3. 76	3. 46	92. 0
Food grains	2. 89	2. 15	74. 4
Feed crops	2. 46	2. 70	109. 8
Cotton and cottonseed	2. 41	2. 82	117. 0
Tobacco	1. 11	1. 34	120. 7
Miscellaneous	2. 56	3. 01	117. 6

[1] From table 1, page 4, Agricultural Economics Research, January 1952.

[2] From table 1, this article.

TABLE 7.—*Realized net income of farm operators, 1947 and 1955*

Item	Realized net income	
	1947 [1]	1955 [2]
	Billions of dollars	*Billions of dollars*
All commodities	16. 80	11. 38
Meat animals	6. 07	2. 89
Dairy products	2. 03	1. 14
Poultry and eggs	1. 02	. 58
Fruits and vegetables	1. 85	1. 66
Food grains	1. 66	. 86
Feed crops	1. 65	1. 05
Cotton and cottonseed	1. 32	1. 03
Tobacco	. 72	. 69
Miscellaneous	. 48	1. 48

[1] From table 1, page 14, *Agricultural Economics Research,* January 1952.

[2] From table 1, this article.

Production expenditures, on the other hand, rose 25 percent from 1947 to 1955 due mostly to higher prices of goods and services. The larger volume of farm marketings resulted in larger requirements for materials and services for production purposes. The prices farmers paid for goods and services used in production also rose about 16 percent in the 8-year period. With a substantial rise in production expenditures, realized net income of farm operators, the difference between the total production expenditures and the realized gross farm income, dropped from $16.80 billion in 1947 to $11.38 billion in 1955, a decline of nearly a third.

Prices farmers paid for most items used in production [1] averaged much higher in 1955 than in 1947, particularly those that were purchased outside of agriculture. Prices in 1955 for farm machinery, motor vehicles, building and fencing materials, motor supplies, farm supplies, and fertilizer averaged about 15 to 50 percent above 1947. On the other hand, prices paid for purchased feed and purchased livestock in 1955 averaged 11 percent and 5 percent below 1947. Purchased livestock, purchased feed, hired labor, and the item including taxes, interest, and net rent in each instance was a smaller percentage of total expenditures in 1955 than in 1947. But the operation of motor vehicles, miscellaneous goods and services, and depreciation were each a larger part of the expenditure total in 1955 than in the earlier year.

Changes in final product demand marketing charges and farm production expenses from 1947 to 1955 resulted in a drop in realized net income to $11.4 billion in 1955 from a high of $16.8 billion in 1947, or 32 percent. The rough allocation of production expenses and marketing margins estimated above suggests also that each of the major commodity groups shared in the decline (table 7).

Meat animals accounted for more than half of the decline in realized net income for all commodities. Cash receipts from meat animals dropped sharply because of relatively low prices in 1955, especially for hogs.

Food grains, feed crops, and dairy products also contributed substantially to the decline in total net income. The drop in net income from food grains reflected lower prices for all major products, smaller production of wheat, and higher prices paid for goods and services used in production. Cash receipts from feed crop marketings rose because increased production of all principal commodities more than offset the 29 percent drop in average prices. Nearly all cost items, however, rose to higher levels and total expenditures increased sharply.

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[1] Average annual prices paid obtained from AMS price reports as recorded by Statistical Services Section of Agricultural Economics Division, A.M.S.

Lower prices for dairy products were more than offset by larger marketings, and cash receipts rose slightly. However, total expenditures increased by about a fourth, with larger quantities of higher priced materials used in production.

The rest of the decline in net income from all commodities (about a sixth of the total) was shared by poultry and eggs, cotton and cottonseed, fruits and vegetables, and tobacco. In all instances, cash receipts in 1955 exceeded 1947. But in each instance, except for fruits and vegetables, expenditures increased substantially.

The study reported in this article makes available rough estimates of final product demand for each major group of farm products, the charges for marketing each of these groups of products, associated production expenses, and the resulting net farm income for each major commodity group. This type of presentation permits a rough indication of the effect of changes in final demand for farm products on the marketing system, demand by farmers for nonfarm inputs, and the impact of these changes on the net income of farmers.

* * *

Winn Finner, for a number of years our Assistant Editor, has left the Marketing Economics Research Division, Agricultural Marketing Service, to serve on a 1-year appointment with the Food and Agriculture Organization of the United Nations as a marketing adviser to the Government of Jamaica, to develop an improvement program in the national marketing of that country. Kenneth E. Ogren, Director of the Marketing Economics Research Division and a past contributor, has replaced Mr. Finner as Assistant Editor.

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Book Reviews

A History of Economic Thought. Social Ideals and Economic Theories from Quesnay to Keynes. By Overton H. Taylor. McGraw-Hill Book Company, New York. 1960. 524 pages. $7.75.

THE LAST FEW YEARS have seen the appearance of a number of good books concerned with the history of economic thought. If this indicates a renewal of interest on any appreciable scale, it is very much to the good, as study of this aspect of economics provides a certain depth, perspective, and understanding sadly needed by many economists and not otherwise obtainable.

The present contribution by Professor Overton H. Taylor of Harvard University is a work of profound and perceptive scholarship. As the editor says, it "embodies the fruits of his life-long studies and reflections, concerned with the history of economic theory *and* the relations of its main developments with the broad general patterns of philosophical and overall social, moral, and political thought, which have been their wider intellectual backgrounds or contexts."

The scope and content of the book stems from Professor Taylor's views of the nature of economic thought. He believes that it consists of a strictly scientific component that can be identified and separately described, but cannot be completely understood or evaluated without reference to "associated" political and social philosophies. Accordingly, he alternates descriptions of the economic systems formulated by some of the great economists with interpretations of relevant social-philosophical ideas and influences. This dual treatment of the subject matter means that it is possible to examine the ideas of only a relatively small number of economists. The final product, therefore, is a highly selective survey rather than a comprehensive history of economic thought.

The first three-fifths of the book (11 chapters) centers on the English classical economists, plus Karl Marx. Taylor's starting point is the 18th century "Enlightenment" (with special reference to Locke and Newton) and the Physiocrats. Then he turns to Adam Smith's forerunners in moral philosophy; namely, Shaftesbury, Mandeville, and Hutcheson. Smith's own ideas on science and philosophy are culled from his *Philosophical Essays* and *Theory of Moral Sentiments.* Against this broad background, the economic theories and policies of the *Wealth of Nations* are explained and evaluated. After a chapter on "Benthamism," the contributions of Malthus, Ricardo, Mill, and Marx receive similar treatment. This treatment, however, is at once so comprehensive and so intricate as to preclude any sort of summarization. One can only say that these economists emerge, not as narrow specialists concocting economic theories in a vacuum, but as wide-ranging thinkers gradually bringing their economic ideas into focus within a shifting framework of social philosophies and forces.

The final two-fifths of the book (6 chapters) is of a somewhat different character than the preceding portion. Not only does it cover a longer time span in fewer pages, but general developments during certain periods receive more attention than the economic systems of individual economists. In fact, only Marshall, Chamberlin, and Keynes get anything like the full-scale treatment accorded to Smith, Ricardo, and J. S. Mill.

Chapter 12, "Victorian Conservative Liberalism and Neoclassical Economics," provides a transition from the end of the English classical period to the arrival of Alfred Marshall. This is a very difficult period to deal with, but Professor Taylor has done a remarkable job of weaving together such diverse strands as 19th century liberalism, the psychological approach, marginal analysis, and mathematical economics into a meaningful whole. In particular, he has been able to avoid the almost inevitable confusion that arises when one attempts to explain the period in terms of individual schools, such as the Austrian, Scandinavian, Walrasian, and so on. Next comes a chapter devoted to Alfred Marshall—mostly to a summary of his *Principles*. This is a careful, systematic job which retains many of the subtleties of the Marshallian analysis. Accordingly, it is not easy reading.

Chapters 14 and 15 deal with the conflicting ideologies and regimes that led to World War II, as well as those that are still with us. Specifically, Taylor surveys communism, facism, democratic socialism, and what may be termed "New Deal liberalism." Here again he covers and illuminates a long stretch of intellectual territory. I think too much space is given to demolition of the Communist theory of capitalist imperialism. We know the Communists' interpretation is hopelessly wrong, but they will never admit it. The sections on Fabian socialism clarify this episode in British economic thought, which has always been something of an enigma to many Americans. The brief concluding sections, which trace the metamorphosis of the social and economic climate of the United States from classical liberalism to the interventionist liberalism of the New Deal, are interesting and stimulating, but this is far too complex a subject to be presented satisfactorily in a dozen pages.

The two final chapters carry the same general title of "Recent Developments of New Economic Theories Relevant to Problems of Public Policy." The first centers on E. H. Chamberlin's *Theory of Monopolistic Competition*; the second on the Keynesian system. Here Professor Taylor focuses on two critical developments in modern economic theory which, though having their roots in the neoclassical schema, have had far-reaching policy implications at variance with some of the tenets of classical economic liberalism. The Chamberlinian analysis points to the prevalence of monopoly elements throughout the price system, implying that *laissez-faire* does not guarantee a predominance of competition with its alleged beneficent effects on economic efficiency and welfare. The Keynesian analysis uncovers certain flaws in the capitalistic process which prevent the automatic maintenance of the aggregate money demand for goods and services at a level sufficiently high to ensure continuous full employment of labor and other resources.

Though there should be little dissent with the selection of Keynes and Chamberlin (or, alternatively, Joan Robinson) as key figures in recent economic thought, these chapters leave one with a sense of incompleteness. In my opinion, two individuals are insufficient for the purpose at hand. This opens up numerous possibilities, but my tentative personal inclination would be to add at least Pigou and Wesley Mitchell, and a fuller treatment of Schumpeter's contributions. Mitchell I regard as especially important. He typifies the urgently felt need for a better factual knowledge of the economic process and is also a significant figure in American institutional economics. This movement, though it never produced a comparable body of theory, early recognized that the neoclassical analysis did not provide a fully satisfactory representation of the functioning of modern economic society. I would argue that it prepared the way for a ready understanding and acceptance of Keynesian and Chamberlinian ideas among American economists.

This book was not designed as a text, but the introduction notes its possible usefulness for this purpose. However, the relatively large space given to the English classical period and the high degree of selectivity throughout are likely to operate as limiting factors. Professor Taylor's hope that the book will be of interest to a wide variety of lay readers seems optimistic. One of the barriers here is the frequent appearance of extremely long and elaborate sentences, which seem almost like verbatim reports containing all the qualifications and nuances of the scholarly lecturer.

Such questions as I may have on particular portions or aspects of Professor Taylor's study do not alter the high opinion of the volume as a whole expressed at the beginning of this review. It is indispensable to any economist seriously interested in the history of his subject, and merits a place beside Schumpeter's *History of Economic Analysis* and Stigler's *Production and Distribution Theories*.

J. P. Cavin

Economic Theory and Organizational Analysis. By Harvey Leibenstein. Harper and Brothers, New York. 349 pages. 1960. $6.00.

PROFESSOR LEIBENSTEIN'S purpose in this stimulating work is to develop a theory of organization and to explore its applications to microeconomic theory.

In the first section, he gives a concise account of received theory covering demand, the competitive firm in the short run, the competitive economy in the long run, monopoly, monopolistic competition, and oligopoly. Although it is not strictly needed for the task at hand, the section provides a useful summary.

The author next considers the link between economic theory and organization theory: Specialization, considered as the division among workers of a set of activities that defines a process (not the subdivision of different phases of product output among firms, the usual concept of specialization in economics). The difficulties of knowing when a process is more specialized in one case than in another are explored, and some interesting suggestions for measurement are given.

He then launches his theory of organization. He follows the path of Chester Barnard and Herbert A. Simon, that is, he builds a few basic ideas on organization into a structure of thought. The unit of analysis is the *role.* Roles always appear in human organization because efficiency demands that activities be specialized and performed in convenient bundles. Eight role types are recognized, three of which (direction, linkage, performance) are basic to any organization, and three more of which (role-determining, player-determining and pay-off determining) are essential for an independent organization. Hence, there is a continuum of organizations from the less to the more independent. A firm is an independent organization whose destiny is determined by the magnitude of its total payoff, which in turn depends upon its total performance.

A role is a set of all permissible role interpretations, not a fixed or routine assignment. Almost anyone with a fixed assignment also enjoys contingent fields of action which provide scope for his overall activity in the organization. A role is all the possibilities of behavior in the assignment. An organization is a set of related roles in which the organization not only can perform but also can gather information about the changing environment and about possible changing capacities and activities with the organization. For such reason, it may be desirable to have more than one role interpretation within a role so that an individual can in fact shift from inferior to superior activities without redefining the assignment.

On such conceptual foundations the author considers in a sequence of chapters the authority-communications mechanism, the motivational elements, organizational equilibrium, and economical and efficient organizational structures. Many propositions are advanced and conclusions drawn. For example, a cogent discussion shows why it is meaningless to argue about centralization versus decentralization as an issue. One of the most important ideas advanced in the book is that large complex organizations need not be less efficient than lesser organizations. Large organizations may enjoy many advantages of specialization, particularly in administration. Production diseconomies usually can be avoided, as the organization expands, by replicating optimum size plants (and other suborganizations).

The final section of 79 pages examines some implications of what is reviewed above, for economic theory, particularly for firm growth, long-run cost behavior, and the stability and determinateness of ologopolistic competition. This is the payoff section for economists.

Professor Leibenstein's bold adventure has many interesting possibilities on several fronts. But for economists it remains to be seen how much his organization theory really improves the usefulness of conventional economic theory and how much it is another method of showing the deficiencies of received doctrine.

One major difficulty occurs to this reviewer. An important result of confronting economic theory with organizational theory is to enlarge the usual conception of the cost computations of the firm as it considers how to adapt its organization in the process of growing larger. This is an excellent idea. Yet one mistrusts where the author comes out with it. He sees no obvious cost limitations on how big the firm can get (other than periodic awkward cost positions on its way up), if it goes about its business properly (except in the case of increasing cost industries).

The author holds at least one tenuous proposition favorable to his view; namely, that large organizations tend to attract the highest quality of personnel (page 193). Furthermore, he overlooks an important matter when he implies that market uncertainties in selling a firm's output can often be mitigated by sheer size and experience (chapter 16). The right insight is provided but only in another connection, when he says "the greater the size group . . . the more important a mistake may be, since it will affect a larger number of individual activities" (page 224). But one needs to apply this basic idea to enterprise investment as well as to direction of basic work teams. In the face of market uncertainties, diversification is sensible, particularly as a firm becomes larger. While a replication of optimum-size plants would avoid diseconomies, were the firm to expand its output of a product beyond the optimum for a single plant, this idea could exaggerate the attractiveness of this method of growth. It may be more attractive to diversify investment in ways that do not show up as a replication of production and organizational facilities.

This is part of a general difficulty. The author has not freed himself altogether from the limitations of neoclassical economic theory which (1) is limited to an industry defined as a group of firms making a single product, and (2) does not recognize asset composition and preference as important in decisionmaking. Consequently, some of the economic problems of the market are not really solvable within the framework of theory as presented.

Allen B. Paul

The Theory of Linear Economic Models. By David Gale. McGraw-Hill Company. 330 pages. 1960. $9.50.

PROFESSOR GALE is convinced that as a mathematical tool of economic research, the use of linear programming, and of the related linear models, is here to stay, and he has therefore prepared a textbook that presents the mathematical theory of the models most widely used in economics. Although the author uses economic data in his problems, he makes no attempt to evaluate the applicability of a particular model to economic situations, but he deduces in rigorous fashion the consequences of mathematical assumptions. In this presentation, with the related exercises, we find a mathematically unified treatment of many important proofs which were previously available only in scattered sources in the literature of economics and mathematics.

This book is an excellent text on applied mathematics for economic students who are fairly well-trained in mathematics. An economist interested in improving his mathematical skills could gain considerable knowledge by intensive study of the volume and by working through the practice problems. The mathematics beyond elementary calculus that is necessary for understanding the material is given in chapter 2. But a student needs to have ability to follow a moderately involved mathematical argument. This requirement will limit widespread use of the book for reference by individuals in the behavorial sciences whose training in mathematics is limited. These persons have a greater need for books in the theory of economics utilizing linear models as presented by Dorfman, Samuelson, and Solow in *Linear Programming and Economic Analysis*, or in methods of using linear models in research as presented by Heady and Candler in *Linear Programming Methods.*

Burton L. French

The Farm Management Handbook. Third edition. By I. F. Hall and W. P. Mortenson. Interstate, Danville, Ill. 425 pages. 1960. $6.00.

SINCE PROFESSOR FRED W. CARD published his pioneer text in the field of farm management in 1907, a long succession of textbooks designed to present the theory and practice of farm management have appeared. This reviewer has followed them closely through the years. They reflect both a steadily growing body of information useful in planning a profitable farm business and an intelligent appreciation of the increasing importance of management as a factor conditioning farm success.

Most farm management texts are designed as textbooks for classroom use. More than any of the other texts in this general field, this contribution of Hall and Mortenson is, as the title indicates, a handbook to guide the operating farmer in making wise decisions in the operation of his business.

The book is well written and attractively and effectively illustrated. It contains a wealth of factual information needed in farm planning. It presents in an interesting way the dynamic nature of this age-old business of farming, and stresses especially new developments in farm techniques and their role in helping farmers to meet the increasing demands on their managerial ability.

Although it is not all well adapted to use as a college text, this farm management handbook should prove useful in general high school courses in farming and farm management, where a less technical presentation of the subject is made. In the hands of instructors who do not have specialized training in the field of farm management, this work may, in fact, prove more useful than the type of technical text commonly used in college courses in farm management, especially those designed for majors in the field.

Surprising to this reviewer is the fact that the authors pass over lightly, or miss altogether, some of the important current techniques in the field of farm management analysis. They place little stress on factor analysis as a basis for detecting possible weakness in the farm business and they fail to emphasize the highly significant substitution method of building a better farm organization. This is the more surprising because of the senior author's long and fruitful experience in this field, first in his native New York and more recently in Wisconsin.

Another striking omission is the failure to discuss or consider the various types of farm management services—educational, cooperative, and commercial—that are now available on an increasing scale. These services are growing rapidly and seem destined to play a role of increasing importance as farming becomes more specialized. The reviewer hopes that some of the items missing in this third edition may find their way into subsequent revisions.

George A. Pond

Economics of Transportation. By D. Phillip Locklin. Fifth Edition. Richard D. Irwin, Inc., Homewood, Illinois. 874 pages. 1960. $10.65.

THE ESSENCE of transportation can be expressed simply—moving goods and people from where they are to where they should or want to be. But its impact on the Nation's business and social life is more complex and widespread than probably any other economic activity. For example, areal specialization of agricultural production depends upon the ability to ship products to markets. The growth of agricultural activity in one area as compared with another—such as oranges in California as compared with oranges in Florida—is vitally affected by the difference in transport costs from each producing area to each of the competitive markets.

Processing plant locations that are profitable at one time often become obsolete because of changes in the transportation setting. Prices of commodities are affected by transportation, not only as a cost item but more importantly as a stabilizing factor, because supplies may be diverted from depressed markets. Many interregional price differentials are controlled largely by transport charges or cost of shipping.

The explosion of American cities was sparked by the automobile. Many of the central-business-district problems arise from traffic congestion, and the future of the urban complex will be greatly affected by future trends in transportation. The location and nature of wholesale and retail outlets are in a state of flux in response to new situations created partly by transportation.

Government is vitally concerned with transportation—with the construction, maintenance, and operation of such facilities as highways, waterways, and air navigational aids, with the regulation of rates, service and other aspects of public carriers, and with the protection of public safety. Government policies affect not only common and contract carriers; they also bear directly and indirectly on private transport.

Professor Locklin takes this broad view of transportation; he discusses almost the entire spectrum of economic and regulatory aspects. First he sets the stage by discussing briefly the economic significance of improved transportation, and the impact of freight rates on prices and location of industries. This is followed by a historical sketch of the development of transportation from Colonial days to the present. Slightly more than half of the book then is devoted to a rather full discussion of the theory of railroad rates, rate structures, policies, and regulatory decisions that have emerged from a long history of Federal and State commission action. This discussion forms a good background for understanding the briefer discussions in the book on other means of transport. The subject matter in the highway, waterway, and air fields is split functionally into two broad areas—promotion and provision of facilities on the one hand, and regulation of carriers on the other.

The first edition of this book appeared in 1935. Those who are interested in studying the evolution of a college text will be more than repaid by a review of each of the 4 editions that have been written during the last 25 years. The college student is the focal point for each edition. The flavor remains much the same, but the discussions have been sharpened and modernized. The multiplicity of issues that are involved in this broad field conflicts with the space limitations of a single volume. As a result, most of the discussions are condensed to a point where the reader may have the feeling that the book is a set of summaries. However, this is supplemented by "selected references" at the end of each chapter and extensive footnotes throughout the text, which lead to more detailed source materials. In addition to being a useful college text, the book should prove valuable as a reference work to anyone concerned with locational and distribution problems, though his interest in transportation in its customary context is slight.

Donald E. Church

Fundamentals of Forestry Economics. By William A. Duerr. McGraw-Hill Book Company, Inc., New York. 579 pages. 1959. $9.50.

DR. DUERR'S BOOK on the economics of forestry should find its place among such other industry treatments of economics as works on farm management or on the steel business. Along with current standard works on dendrology and forest mensuration, it should occupy a prominent place on the shelves of foresters, for economics is as important a tool in forest management as in logging engineering.

The dust jacket avers that the purposes of this book are "... to help the forester become a capable planner . . . and to help him become an intelligent witness to events around him. . . ." In his preface, Dr. Duerr says that he is writing to students of forestry, in college and out, although most readers will infer that the chief audience is intended to be college forestry majors who have enough room in their curriculum for a quick dose of economics.

As a college textbook on economics for forestry students, it accomplishes its purpose. It is chiefly a straightforward treatment of modern economic theory, with illustrations drawn chiefly from forestry firms, but the purist in economic theory can find points to quibble about here and there. For example, the statement that "the rate of interest is an index of the efficiency of investments over time, and of men's depth of time perspective . . ." could start a debate wherever economists meet. But any book on economics can set off lively discussion among economic theorists.

The college student without a fair head start in economic theory will find it tough going in places, even though the style is lucid. Dr. Duerr is to be congratulated on giving us a work on economics relatively free from the heavy style that characterizes so much of our literature. Readers can breeze through most of the book with relative ease.

The book is in 5 parts and 33 chapters, a good size for a 3-hour one-semester course, if students and professor hustle along on the heavier sections, and even for a two-semester course, if the treatment is more thorough. The introductory chapters tell something about both economics and forestry. A case is made for a special treatment of the economics of forestry by citing Dr. Henry Vaux to the effect that timber growing takes a long time, timber is both capital stock and finished product, and many forest values are not measured by ordinary markets. One can accept these premises with little argument, although to this reviewer a case need not be made for special-industry treatment of economics. Each industry, be it steel or dairying, has its unique characteristics and deserves good literature dealing with the application of economic principles.

Production economics, comprising part two, emphasizes the economic management of the timber-producing firm. The treatment is workmanlike and conventional but not especially new. One could easily substitute the word "farm" or "packing plant" for "lumber company" throughout much of the section. Such a substitution would make it an equally appropriate treatment of production economics as applied to other industries. Perhaps this demonstrates only that the principles of economics have a universality not often recognized by specialists in a given field.

One might wish for greater attention to the macroeconomics of forestry, including its relationships with other industries and its place in our total economy, rather than, or in addition to, the emphasis given the economics of the firm. But this expansion of the subject may have opened a Pandora's box of material not easily encompassed within the covers of a single volume designed as a text. One might also wish for some treatment of programing as a tool in production planning, as programing may have special adaptability and usefulness in forestry.

Part three deals with demand and marketing in a way that applies more specifically to forestry than does the previous section. This section should be of special interest and usefulness to the forester who is looking back on his bachelor's degree and ahead to successful operation in the business of supplying forest products to consumers. One would have expected Dr. Duerr to handle the subject of business cycles in a more sophisticated way. Variations (cyclical or not) in economic activity can occur in segments of modern industry. Some of these variations may have no relation to general business cycles but may influence forest industries significantly.

The five chapters in part four deal with institutions of the forest economy. The author first treats "centers of influence." This discussion is refreshing, for it recognizes, as economics textbooks rarely do, some of the realities of the political and social world within which we all live and do business—realities that inhibit or liberate our actions, and thereby prescribe bounds within which we move and beyond which we cannot go without cost or pain. Institutionalists of the John R. Commons influence will applaud.

The tenure question, treated with taxation and credit in part four, is handled chiefly from the viewpoint of the timber producer. It is to be marked down for failure to treat with those "sticks" in the tenure bundle on forest land held by interests of water, game, recreation, and so on. The chapters on forest taxation and credit are good, though the credit chapter fails to mention the lack of liquidity of growing timber as an important factor affecting the supply of loan funds to the forest-growing industry.

The weakest section is part five, which deals with the operation and planning of the forest economy. It describes briefly the forest economy of the world and deals with planning and broad social and economic problems. Without extensive supplemental reading it is doubtful whether undergraduate students would get more than a smattering of the processes and problems of public planning from this treatment, and experienced foresters at the policy level in either Government or industry will find little here that is helpful.

In total, the book is good and the style of writing especially pleasing, its greatest merit being use as a text for college courses. But those who have their college years behind them will find much to inform and stimulate them.

M. L. Upchurch

Rural Planning of One County—Worcester County, Massachusetts. By John D. Black and George W. Westcott. Harvard University Press. 419 pages. 1959. $9.50.

IN 1937, the authors of *Rural Planning of One County* joined forces with representatives of other Federal, State, and private agencies to undertake an intensive planning study of Worcester County, Mass. Although the special focus is on this county, the book has a broad field of interest, and it reflects the long experience of the authors in research, planning, and education.

In a sense, this book represents the climax of the senior author's comprehensive study of New England agriculture which he began during his first year at Harvard (1927–28). From that time until his death in early 1960, he worked on problems of this region as much as the many other demands on his time would permit.

In 1933, the junior author joined the staff of what is now the University of Massachusetts as extension agricultural economist. Except for temporary leaves of absence, he has continued in this work since that time. It is evident that both authors approached this task with a rich and intimate knowledge of the agriculture of the region.

The land resources and the historical development of Worcester County are described and analyzed in detail, including an analysis of the urban sector, which provides the market for farm products.

The analysis of Worcester County is fitted into the setting of New England agriculture as a whole by drawing on the reports of other studies of the region, especially "The Rural Economy of New England; A Regional Study," by John D. Black, 1950; "Planning One Town—Petersham, A Hill Town in Massachusetts" (actually one of the towns in Worcester County), by John D. Black and Ayers Brinser, 1952; and "Planning for Successful Dairying in New England," by Richard G. Wheeler and John D. Black, 1955.

One chapter in the book is devoted to the county land-use planning movement. Worcester County was selected as an "intensive planning county" in this nationwide program. Description of the national effort begins with the early work of the Program Planning Division of the Agricultural Adjustment Administration. It then traces the development of the "Mount Weather agreement" and the organization of the Division of State and Local Planning in the Bureau of Agricultural Economics to cooperate with the land grant universities in this endeavor. The authors conclude that the program of land use planning under the Mount Weather agreement would have been continued if World War II had not intervened.

The planning of individual farm and forest units is taken up in detail, by towns and by different sections of the county. Alternative farm-improvement budgets for modal-type case farms were worked out in 1938. The alternatives for each farm were discussed with the farm family, and on the basis of these discussions, the family selected the alternative plan that seemed best suited to its needs and interests. In 1945, the changes that had been made on the case farms were noted, and revisions in plans were made in view of changes in market conditions, family situation, and other factors. This step was repeated in 1954–55.

From the analyses of case farms and forest units, as well as from data on changes in each town, an attempt was made to project a program of development, area by area, and for the county as a whole. This is an essential step in any rural planning, and this book would be a more helpful guide to planning in other areas if this phase had been more fully developed.

In the last chapter, the authors make specific recommendations for approaches to rural planning, based on their experience as well as that of their associates in this work. Anyone concerned with rural development, conservation planning, or for that matter with any program of rural improvement, will find stimulating ideas in this chapter. Planning approaches are outlined in relation to policies, programs, operation, and evaluation.

Sherman E. Johnson

Seeds That Grew: A History of the Cooperative Grange League Federation Exchange. By Joseph G. Knapp. Anderson House, Hinsdale, N.Y. 535 pages. 1960. $6.50.

DR. KNAPP—Joe, as most of us know him—has demonstrated that a history can be scholarly without being dull and pedantic. He has turned out a most interesting, readable, exciting book. But it is obviously more than this. It is a penetrating analysis that will help anyone to understand not only the development of the Grange League Federation, but also the whole cooperative movement in the United States. Beyond this, it throws light upon the development of our entire marketing structure—whether cooperative or not. In a modest way, it even contributes to an understanding of the issues of "farm relief," whether by governmental assistance or by "self help."

Dr. Edwin G. Nourse wrote a short but illuminating foreword to the book, emphasizing the value of cooperatives as pacesetters, and commenting upon the close relationship between the G.L.F. and the agricultural colleges and experiment stations. Dr. Nourse was one of the early leaders in the cooperative movement. He actively opposed those in the 1920's who thought that farmer cooperatives could raise prices by monopoly controls. Rather, he foresaw that the lasting benefits of cooperatives would come mainly through better and more efficient service to farmers. Joe Knapp's case history of the G.L.F. is in the Nourseau tradition.

The title, *Seeds that Grew*, is quite apt. From the start, the G.L.F. has emphasized better seeds. Before World War I, most farmers in New York State grew their own seed, or bought from neighbors. The supply and quality of commercial seeds were generally not dependable.

As early as 1913, H. E. Babcock (then the county agent for Cattaraugus County), formed a committee to pool seed orders and to obtain the needed amounts from reliable sources. It is this same H. E. Babcock who, more than any other single person, becomes the hero of the book, guiding the G.L.F. through many troublesome years. His little seed program, back in 1913, was only the beginning of a wide variety of services in purchasing supplies for farmers and in marketing the farmers' products.

Mixed feeds—especially those for dairy cattle and poultry—have always been among the most important supplies handled by the G.L.F. As in the case of seeds, the first effort was to find dependable sources of feeds of known quality at a reasonable price. This soon led the G.L.F. to adopt "open-formula" feeds. The formulas were obtained from the animal nutritionists at Cornell.

The open formulas took much of the mystery out of mixed feeds, so that farmers knew exactly what they were buying. But the open formulas sometimes reduced the flexibility of the feed business and made mixed feeds unnecessarily expensive. As J. A. McConnell wrote, in reviewing the early experience with open-formula feeds:

"Actually, we know now that a big feed pool of this sort, based on a fixed formula, was bound to bull the market. We finally got out of that deal by making what was called '20% Emergency Dairy,' based on a very cheap purchase of barley which happened to be plentiful and low priced that particular year. This experience pretty much wound up the feed-pool idea, and thus was born the flexible formula idea which G.L.F. has used ever since."

And Babcock, writing in 1923, stated: "We should build for the future on the basis of minimum protein content and maximum digestibility. With these two fundamentals in mind, we should then abandon the fixed formula, but not the public formula, and proceed to mix a feed that will hold a place for itself on the basis of economy."

This is one of many illustrations of lessons that were learned the hard way. As linear programers were to find 25 years later, feed mixing involves two sciences: nutrition and economics. Good feed must meet specifications for nutrients, but it must also be sold at as low a price as possible—taking advantage of whatever ingredients may be plentiful.

Many such lessons can be learned from Joe Knapp's fine book. To me, the most general lesson is that a business concern (cooperative or not) should keep flexible if it is to live through depressions and wars, if it is to grow and prosper, and if it is to give maximum service to farmers and to the public.

Frederick V. Waugh

Tobacco and Americans. By Robert K. Heiman. McGraw-Hill Book Co., New York. 278 pages. 1960. $7.50

THE IMPORTANT ROLE that tobacco has played in the history and lives of Americans is presented in this 278-page volume. The book is well organized, profusely illustrated, and engagingly written. The author has advanced degrees in sociology, has been a financial editor, and, for several years, has been with a large tobacco-manufacturing company. He knows tobacco history very well, and his training in sociology undoubtedly contributed much to this balanced and interesting account of the way tobacco has been intertwined with the lives of Americans for the last 450 years.

The first of the eight chapters in the book gives an account of the discoveries of tobacco by Europeans during the voyages and explorations of Columbus, Thevet, Verrazano, Hawkins, and others. Following this, the author carries us through the early Spanish, French, Dutch, and English rivalries in the New World and highlights the early uses of tobacco in Europe in those times. The major role played by tobacco in the economies of the English colonies of Virginia, Maryland, and Carolina is then developed. Great figures in early American history appear—Patrick Henry, George Washington, Thomas Jefferson, James Madison, and others—as they move toward establishing a new nation. Tobacco in one way or another impinged significantly on the lives of many well-known leaders in the Revolutionary period.

Chapter four tells about tobacco in New England from the early period of the Yankee traders. Much of this chapter is devoted to the early development of the cigar and its big gain in popularity in the 19th century. Next, the author traces the part played by tobacco as the Nation grew westward "across the Appalachians"—the new producing areas in Kentucky and Tennessee—and the large consumption of tobacco in the form of chewing products. We then follow tobacco through the Civil War period and its commercial revival following the conflict.

The author traces the story of the tobacco industry in New York City from New Amsterdam to the beginnings of the cigarette era, and we are brought into this century to see the fascinating growth of the modern cigarette industry. The triumph of the American blended cigarette, the rivalries of the brands, the part played by tobacco in the two World Wars, the Government program of crop control, the advent of filter tips, and other related topics are touched upon.

There are 10 clear charts showing consumption of the various tobacco products, burley tobacco leaf prices, taxes collected on tobacco products, and total exports of leaf tobacco over a long span of years. Only a few minor errors in the author's sparing use of statistics in the narrative were noted by this reviewer.

This volume contains some shrewd observations on the economic aspects of tobacco throughout its long history. The author also has some pertinent comments on present-day economics of the tobacco industry. Most students and observers of the tobacco industry will agree with the interpretations made on most counts. But the treatment accorded the crop-control program has the tinge of the tobacco buyers' slant and tends to gloss over the difficult problems that have confronted the 600,000 tobacco growers of this country.

A splendid feature of the book is the remarkable collection of illustrations, including both reproductions of photographs and sketches, which number about 300. They occupy parts of nearly every page and, together with the fine writing style of the author, make this an interesting book for anyone who has even the slightest interest in tobacco and its history. Finally, a detailed index contributes significantly toward making the volume one of lasting usefulness.

Arthur G. Conover

Manioc in Africa. By William O. Jones. Stanford University Press. 315 pages. 1959. $6.75.

WHY WRITE a 315-page book on manioc in Africa? At least two good reasons can be given: Manioc is the staff of life of the African population, and no one had written a book on manioc in Africa—at least, not a full length modern book in English.

Manioc is also known as cassava, tapioca, yuca (not yucca), aimpim, and mandioca. Dr. Jones has chosen the term "manioc" because it is the same in English and French and is as well known as any other term.

A Brazilian crop, manioc (cassava) was introduced into Africa in the 16th century by slave traders and has since spread throughout Africa south of the Sahara and north of the Zambezi River. It is now an important crop to about 65 percent of tropical Africa's population and is a casual crop to many more, according to the author of this work.

A semiwoody, shrubby plant, manioc grows 5 to 12 feet high. A perennial, it is usually allowed to grow only 18 to 24 months. The stem is rather fragile and pithy. The plant grows leaves, flowers, and fruits, but it is valued chiefly for its starchy underground roots.

At the time of harvest, manioc contains a poison —prussic acid—in its roots, branches, and leaves. Customarily, the quantity of prussic acid in the edible parts of the roots is the criterion that determines which are the "sweet" and which the "bitter" varieties. Bitter varieties contain more prussic acid than sweet ones. But the variety and the external appearance of the plant are not true indicators of prussic acid content, according to the author. The prussic acid content, he indicates, "varies markedly with growing conditions, soil, moisture, temperature, perhaps altitude, and with the age of the plant." Roots with a high prussic acid content must be steeped in deep, gently running water to remove the poison. After steeping and peeling, the fibrous center part is removed, and the roots are dried and pounded into flour.

Manioc has a rather bland flavor. It is usually eaten with pepper or meat sauces or with vegetable oils and plant leaves. It has several advantages—high calorie yield per acre, good growth in poor soils, drought and insect resistance, and adaptation to good ground storage. But manioc is poor in all human nutrients except starch, and it is alleged to be a soil depleter.

Even so, the author feels that to condemn manioc because of its low protein and fat content is no more logical than to say "that beef has little nutritional value because of its low starch content."

"In fact," the author goes on with a touch of humor, "it is an old adage of nutritionists, or at any rate it should be, that there are no bad foods, only bad diets."

In his book, this eminent economist, a professor in the Food Research Institute of Stanford University, writes first of manioc (cassava) in general; of the land, climate, and peoples of Africa; and of the history of manioc's introduction and spread throughout Africa. Then, in two chapters, he tells of present-day methods of cultivation and preparation for eating. At this point, he takes a regional approach and discusses manioc in the Congo region (Belgian Congo and neighboring countries), Guinea (West Africa from Nigeria west), and East Africa. In a final chapter, "Manioc in a Developing Economy," he sums up his thoughts on a subject to which he has devoted much time and research. Here he also suggests that manioc may in time become a low-cost animal feed, for hogs especially.

The book is extensively documented. Chapter 6 alone lists 83 citations, wisely so-called, rather than "references," for many of the author's sources are not available to most library users.

If any reader of this review has plans for a book on manioc in Africa, he should lay them aside. *Manioc in Africa* should be the definitive book on the subject for the next 30 years, at least.

Snider W. Skinner

Industrial Estates: Tool For Industrialization. By William Bredo. The Free Press, Glencoe, Illinois. 243 pages. 1960. $6.00.

ALTHOUGH the establishment of industrial estates has recently become one of the major tools for effecting orderly industrial development, this institutional arrangement is not an innovation of recent origin. The idea, born in England at the turn of the century, has found expression in the expanding numbers of industrial estates in the United States as well as in many other countries throughout the free world.

The experience of industrial estate promoters has been generally favorable. Well-organized estates have been found to offer external economies to small- and medium-sized industrial establishments. Bredo's concept of "nursery" factories is intriguing. Small factories located on the estates are provided ample space to grow as they are nourished by the external economies which the estate provides. This is only one of several features that have contributed to the ready acceptance of this tool among underdeveloped countries now attempting to achieve further industrialization. Presumably, a study of the experience record of industrial estates will provide guidelines to those who plan to use this device both here and abroad.

This is what Bredo does in *Industrial Estates.* He presents a lucid expository account of the growth of these estates, including several "how to" chapters, and an extensive appendix. The appendix provides numerous actual case descriptions, as well as examples of typical agreements consummated by estates and their tenants.

Bredo's *Industrial Estates* should attract a wide audience. The general reader, the researcher, and the area development specialist will find a nontheoretical frame of reference applicable to his area of interest.

Agricultural economists, particularly those who work with the Rural Development Program, will be able to apply the Bredo work to their studies. Many researchers concerned with the low-income problem in agriculture regard industrial development as a partial answer to the underemployment problem in low-income areas. But the limitations of the industrial estate technique must be borne in mind, for example, the establishment of industry in estates presupposes that the problems associated with choosing industries to be appropriately located at the proposed estate site have been surmounted.

As do many studies that chart the pathway, Bredo's study raises numerous questions. We would be interested to learn how industrial estates may affect the cost structure of plants locating there, vis-a-vis their competitors. The information contained in this practical volume might well be applied to the increasing body of locational theory. Perhaps answers to some of these problems will be forthcoming in later studies.

Paul R. Kulp

Selected Recent Research Publications in Agricultural Economics Issued by the United States Department of Agriculture and Cooperatively by the State Colleges [1]

ANDERSON, KENNETH E., AND HAWES, RUSSELL L. THE HOUSEHOLD MARKET FOR SELECTED CANNED FRUITS AND VEGETABLES. U.S. Dept. Agr. Mktg. Res. Rept. 427, 33 pp., illus. Sept. 1960.

More than half of all families bought canned peaches, fruit cocktail, snap beans, corn, and peas during the 12 months studied. About 6 out of every 10 families bought peaches and almost as many bought fruit cocktail. Slightly more than half bought snap beans, and 7 out of every 10 bought corn and peas. Purchases of most items were lower in the South than in other parts of the country.

BARKER, R., AND HEADY, E. O. ECONOMY OF INNOVATIONS IN DAIRY FARMING AND ADJUSTMENTS TO INCREASE RESOURCE RETURNS. Iowa Agr. and Home Econ. Expt. Sta. Res. Bul. 478, pp. 747–764, illus. May 1960. (Agr. Res. Serv. cooperating.)

Under the prices and costs assumed, the breakeven point at which price per unit just equals cost per unit varies from 22 to 26 cows, depending upon the milking system. A comparison of costs and returns to labor shows that, for herds of 25 cows or more, loose housing has an advantage over the conventional stanchion barn, which increases with increase in herd size. Analysis indicates that grade A dairy farmers who adopt loose housing and expand herd size are capable of earning a return to labor comparable to an urban wage rate.

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[1] State publications may be obtained from the issuing agencies of the respective States.

Belcher, John C., and Hay, Donald G. USE OF HEALTH CARE SERVICES AND ENROLLMENT IN VOLUNTARY HEALTH INSURANCE IN HABERSHAM COUNTY, GA., 1957. Univ. Ga. Bul. N.S. 73, 19 pp., illus. June 1960. (Agr. Mktg. Serv. cooperating.)

Presents a picture of the uses the people of this county make of the health care resources available to them and the opinions of the residents on what might be done to improve general health care in the county.

Bertrand, Alvin L., and Smith, Marion B. ENVIRONMENTAL FACTORS AND SCHOOL ATTENDANCE. A STUDY IN RURAL LOUISIANA. La. Agr. Expt. Sta. Bul. 533, 43 pp., illus. May 1960. (Agr. Mktg. Serv. cooperating.)

Overall aim of study was to determine and describe the factors accounting for differential school attainment in rural areas. By far the largest number (28) of boys questioned dropped out of school because of lack of interest. Over half of the 35 girls interviewed left school to get married. Ten youths indicated they left because they were needed at home; six left for financial reasons; the other three left because of health reasons.

Borton, M. E., and Ellis, H. H. SOME LEGAL ASPECTS OF WATER USE IN LOUISIANA. La. Agr. Expt. Sta. Bul. 537, 114 pp., illus. June 1960. (Agr. Res. Serv. cooperating.)

Some of the legal aspects of water use in Louisiana are explored, with primary emphasis on agricultural uses. Discussion deals mainly with general rules of law that have been adhered to by the State's Supreme Court, in the absence of contractual agreements, prescriptive rights, controlling statutes, or other complicating factors.

Carter, H. O., and Heady, E. O. AN INPUT-OUTPUT ANALYSIS EMPHASIZING REGIONAL AND COMMODITY SECTORS OF AGRICULTURE. Iowa Agr. and Home Econ. Expt. Sta. Res. Bul. 469, pp. 503–538, illus. Sept. 1959.

Analysis is based on a 103-order input-output matrix of which a 90-order submatrix represents agriculture. Model used is applied to 1954 data in an attempt to provide certain descriptive relationships among sectors within agriculture and between agricultural and industrial sectors of the national economy.

Chapman, W. Fred, Jr., Pittman, Jerold F., and Carroll, Adger B. COSTS, METHODS, AND FACILITIES IN PACKING SOUTH CAROLINA PEACHES, 1959. U.S. Dept. Agr. Mktg. Res. Rpt. 425, 32 pp., illus. Aug. 1960. (S.C. Agr. Expt. Sta. cooperating.)

Total costs of packing a container of peaches in 24 packinghouses in the Spartanburg, S.C., area ranged from 90 cents for small packinghouses using ¾-bushel tub baskets to $1.29 in large packinghouses using 1-bushel tub baskets. Underutilization of labor was apparent in large packinghouses, which had large labor forces to take care of peak loads and to pack a wide variety of containers.

Csorba, J. J. FARM TRACTORS: TRENDS IN TYPE, SIZE, AGE, AND USE. U.S. Dept. Agr. Inform. Bul. 231, 16 pp. Aug. 1960.

In 1945, slightly more than a third of our farms had tractors; in 1954 more than 60 percent had one or more. Modern farm tractors are more versatile and easier to handle than those of 20 years ago; they last longer and do more work, and more types are available.. With the increase in average size of farm, size of tractors and number per farm have increased. From 1950 to 1954, the number of farms with two tractors increased 45 percent and those with three or more increased more than 90 percent.

Dailey, R. T., Shaw, M. D., and McAlexander, R. H. ESTIMATES OF SUPPLEMENTAL WATER NEEDED BY FORAGE CROPS IN PENNSYLVANIA. Pa. Agr. Expt. Sta. Bul. 669, 36 pp., illus. (Agr. Res. Serv. cooperating.)

Predictions of future supplemental water requirements are based on an analysis of daily rainfall data for 36 Pennsylvania weather stations for a 31-year period. Data provide information on the number of growing seasons in which an irrigation system might be used, with estimates of the amounts of supplemental water that various forage crops require. A soil with 3.0 inches of moisture in the root zone at field capacity, located near George School, Bucks County, would have needed 8 inches of supplemental water about 60 percent of the last 31 growing seasons; a similar soil at Gettysburg, Adams County, would have needed 8 inches about 90 percent of the time.

Fountain, James B., and Chapogas, Peter G. EVALUATION OF SHIPPING CONTAINERS FOR WASHINGTON CHERRIES. U.S. Dept. Agr. Mktg. Res. Rpt. 426, 26 pp., illus. Sept. 1960.

It costs about $940 less to pack and load a carload of 27,720 pounds of Washington State cherries in 20-pound loose packs than in 15-pound faced packs. Costs of labor and material for packing and loading the 15-pound pack that is faced by hand with two layers of cherries averaged 7.4 cents per pound of cherries, or 3.4 cents more than the loose packs. Other potential savings on the 20-pound loose pack include lower freight costs, smaller overhead costs for fewer workers, and lower marketing costs.

Fox, A. S. CHANGES IN ORGANIZATION, COSTS, AND RETURNS ON DAIRY-HOG FARMS IN SOUTHEASTERN MINNESOTA, 1930–59. U.S. Agr. Res. Serv. ARS 43-124, 48 pp., illus. Oct. 1960.

From 1930 to 1959, dairy-hog farmers in southeastern Minnesota increased the size of their farm organizations and adopted improved production practices. Average size of farm increased by about 24 acres and crop yields by more than 70 percent, with most of the increases occurring after 1950. Milk cow numbers and production per cow increased more than 40 percent. Returns allocated per hour of operator and family labor ranged from almost zero in 1930–33 to about $0.36 in 1940–44 and $0.56 in 1956–59. These returns compare favorably with those on dairy farms in Wisconsin but are generally less favorable than returns in many of the Corn Belt farms to the south.

Frye, Robert E., Hunter, J. Scott, and Van Dress, Michael G. MARKETING ARTIFICIALLY SWEETENED GRAPEFRUIT JUICE. U.S. Dept. Agr. Mktg. Res. Rpt. 432, 43 pp., illus. Sept. 1960.

Sales of grapefruit juice sweetened with noncaloric sweetener increased total sales of canned grapefruit juices in retail food stores covered in marketing survey. During promotion artificially sweetened juice outsold regular juice by almost four to one.

Garlock, F. L., Scofield, W. H., Stocker, F. D., and Others, Under the Direction of N. J. Wall. THE BALANCE SHEET OF AGRICULTURE, 1960. U.S. Dept. Agr. Inform. Bul. 232, 36 pp., illus. Aug. 1960.

Brings together the assets and liabilities of agriculture as though it were one large enterprise. Annual changes shown provide a means of appraising the effects of development in both farm and nonfarm sectors of the economy on the financial structure of agriculture. This is the 16th in a series that contains comparable annual estimates beginning in 1940.

Gerald, John O. USES OF MARKETING INFORMATION BY FARMERS IN MICHIGAN. U.S. Dept. Agr. AMS–418, 15 pp. Nov. 1960.

Nearly all of the 375 farmers interviewed were receiving marketing information at the time of the survey. Most of them used a combination of sources that resulted in their getting current market news and longer run situation, trend, outlook, and other information. A large proportion obtained information through personal contact with dealers, other farmers, truckers, and Government personnel. This information was used primarily to supplement information received through mass media.

Gray, Leo R. PRICE SPREADS, COSTS, AND MARKETING CHANNELS FOR EGGS AND POULTRY SOLD IN TRENTON, N.J. U.S. Dept. Agr. Mktg. Res. Rpt. 434, 24 pp., illus. Oct. 1960.

Reports on a study of factors affecting price spreads for eggs and poultry, including turkeys, in retail food stores, in Trenton, N.J., and wholesale egg and poultry distributors and processors in New Jersey, New York City, Delaware, Maryland, and nearby Pennsylvania.

Greve, R. W., Plaxico, J. S., and Lagrone, W. F. PRODUCTION AND INCOME VARIABILITY OF ALTERNATIVE FARM ENTERPRISES IN NORTHWEST OKLAHOMA. Okla. Agr. Expt. Sta. Bul. B–563, 38 pp., illus. Aug. 1960. (Agr. Res. Serv. cooperating.)

Based on the period 1942–57, variability of production, price, and income per acre was determined for four main enterprises. Estimated returns above specified cash costs with historical prices and costs indicate average returns per acre of $19.02 for wheat and $10.14 for grain sorghum. Returns on rangeland grazed by steers averaged $4.95 per acre; similar rangeland used for a cow-calf enterprise averaged $3. The coefficient of variation of per-acre returns is 42.9 percent for wheat, 68.2 percent for grain sorghum, 79.1 percent for steers, and 45.7 percent for cow-calf enterprise.

Haren, C. C. CONSERVATION FARMING IN SELECTED AREAS OF THE SOUTHERN PIEDMONT. U.S. Agr. Res. Serv. ARS 43–120, 59 pp., illus. Aug. 1960.

Control of erosion is the chief need on upland and terrace soils that make up more than nine-tenths of the area studied. With conservation and maximum development, about four-fifths of the area could be used for crops and pasture. Recent and prospective changes in ownership and operation are paving the way for more complete and better conservational use of the land resources in the area. Farmers able to replace all or most of their cotton with other crops or improved pasture have made progress in diversifying operations and adopting other conservation practices. Improvements in per acre yields of corn and other crops would enable additional operators, who have been handicapped by lack of sufficient land, to shift partly or completely from cotton.

Havas, Nick, Henderson, Peter L., Parsons, Chester S., and Schaffer, Paul. DISPLAYING FRUIT IN VARIOUS TYPES OF PACKAGES AND IN BULK. COSTS AND EFFECTS ON QUALITY AND SALES. U.S. Dept. Agr. AMS–391, 22 pp. illus. Aug. 1960.

Customers bought 18 percent more grapes, in a merchandising test, when the grapes were displayed in open-top bags with handles (home toter bags) than when they were packed in overwrapped trays. Medium-sized oranges in polyethylene bags sold 50 percent better than oranges displayed in bulk alone. The study also includes information on the influence of packages on apples and oranges of premium quality and size and on pears. Costs of the different methods of packing and displaying were also studied.

Heady, E. O., Baumann, R. V., and Orazem, F. ADJUSTMENTS TO MEET CHANGES IN PRICES AND TO IMPROVE INCOMES ON DAIRY FARMS IN NORTHEASTERN IOWA. AN APPLICATION OF PROGRAMMING METHODS IN DERIVING SUPPLY RESPONSES AND IMPUTED RESOURCE VALUES. Iowa Agr. and Home Econ. Expt. Sta. Res. Bul. 480, pp. 791–811, illus. June 1960. (Agr. Res. Serv. cooperating.)

Typical dairy farmers in northeastern Iowa can adjust to a decline in milk prices by improving cropping programs, improving production practices of livestock enterprises, or reorganizing both cropping and livestock programs. In general, prices for hogs and dairy products can range widely before a new plan is needed to maximize profits. On a 1-man 160-acre farm with above average management, and a hog enterprise including 18 spring and 6 fall litters, a plan with 9 dairy cows is stable for all prices between $0.92 and $5.27 when hog prices are held constant at $17.98.

Helfinstine, R. D. farm plans for wheat farmers in north central south dakota. S. Dak. Agr. Expt. Sta. Bul. 488, 40 pp. [1960] (Agr. Res. Serv. cooperating.)

The most profitable and stable production plans for typical wheat farms in the area under differing growing conditions are based on a grain system of farming combined with feeder-cattle and hog-raising or lamb- and hog-raising enterprises. Including alfalfa in the rotation seems unlikely to increase stability or profitability. On a typical 480-acre farm, average annual labor and management income from the small grain-corn-small grain rotation combined with feeder-cattle and hog-raising enterprises is estimated at $7,538 and the coefficient of variation at 82 percent, compared with an average income of $5,535 and a variability of 87 percent from the corn-small grain-alfalfa-corn-small grain rotation with the same enterprises.

Hole, E., and Vermeer, J. estimating cost of production on tobacco-cotton farms in the coastal plain of north carolina. U.S. Dept. Agr. Prod. Res. Rpt. 47, 20 pp., illus. Oct. 1960.

Six procedures for calculating total cost per unit of production are presented. All are based on prevailing cost rates of production items, but each is based on a different assumption of yields, imputed costs of operator and family labor, and land.

Hruschka, H. W., Hansen, J. C., and Findlen, H. protection of chipping potatoes from low temperatures during transportation by truck. U.S. Dept. Agr. Mktg. Res. Rpt. 431, 20 pp., illus. Sept. 1960.

Trucks hauling potatoes to be used for chips will preserve the quality of the cargo better in cold weather if they are equipped with a blower fan system and a heater in both the front and back of the trailer. Chipping quality is injured if potatoes are kept at temperatures much below 50° F. Tests were made with two heaters in the front of the trailer, with two in the back, and with one in the back and one in the front; and with and without fans to circulate the warm air.

Jones, W. Webster. butter and nonfat dry milk production in diversified plants in kansas, missouri, and oklahoma. U.S. Dept. Agr. Mktg. Res. Rpt. 430, 51 pp., illus. Sept. 1960.

Analyzes methods and costs of producing butter and nonfat dry milk in dairy plants in three States. This report is one of several describing in detail various phases of the operations of the plants. The reports analyze procurement, processing, and distribution practices and costs.

Lindsey, M. M. the herringbone milking system. economic appraisal, labor efficiency analysis, and adjustment possibilities. U.S. Dept. Agr. Prod. Res. Rpt. 45, 33 pp., illus. Sept. 1960.

Labor efficiency in this milking system is generally high. For 2,318 cows timed during the study, the average time spent by the operator in the herringbone milking parlor amounted to only 0.93 man-minute per cow. Including time for preparation and cleanup, in 2 hours a skilled operator can milk about 85 cows in a herringbone system, compared with about 60 in a conventional milking parlor or a stanchion barn.

Metzler, W. H., and Armentrout, W. W. rural development problems and prospects in fayette, raleigh, and summers counties, west virginia. W. Va. Agr. Expt. Sta. Bull. 444, 21 pp. Aug. 1960. (Agr. Res. Serv. cooperating.)

Growth and prosperity of this area have been based on the coal industry, where mechanization is cutting down employment. In the open country, most households are nonfarm, and even among the farm households farming is usually a sideline. Many miners will be obliged to leave the area unless new industries and jobs are brought in. The most promising lines of rural development are (1) increased agricultural activity among the younger farm operators; (2) training and career exploration and guidance for youth, particularly those from low-income households; and (3) increased efforts toward industrial expansion.

O'Byrne, J. C., Krausz, N. G. P., Harl, N. E. and Jurgenson, H. the farm corporation. what it is, how it works, how it is taxed. North Central Reg. Ext. Pub. 11 (Iowa Coop. Ext. Serv. Pam. 273), 19 pp., illus. June 1960. (Agr. Res. Serv. cooperating.)

Incorporation of the farm may be useful to farmers in solving such problems as transfer of ownership within a family, limitation of liability, or managing a farm under multiple ownership. Among the subjects discussed here are the nature of a corporation, some advantages and disadvantages of incorporating a family farm, taxation of corporations and pseudocorporations, the process of incorporation, and the operation of a farm corporation.

Powell, Jules V. appalachian apples—packing costs and efficiency. U.S. Dept. Agr. Mktg. Res. Rpt. 435, 20 pp., illus. Oct. 1960. (In cooperation with W. Va. Univ.)

Labor and machinery costs for packing traypack cartons and bags of apples can be lowered by using semiautomatic packing equipment. Packing operations in Appalachian apple packinghouses were studied to find least-cost combinations for labor and equipment.

Pritchard, Norris T. the los angeles egg market. U.S. Dept. Agr. Mktg. Res. Rpt. 440, 43 pp. Oct. 1960.

Although present organization of the Los Angeles egg market encourages efficiency and stability in marketing eggs, the market could be improved. This report lists several recommendations that should be considered by egg producers and distributors and others concerned with the operation of the market.

Rogers, R. H., and Bonnen, C. A. economics of mechanical cotton stripping on blackland farms. Texas Agr. Expt. Sta. Bul. 949, 11 pp. March 1960. (Agr. Res. Serv. cooperating.)

Income may increase $10 to $25 a bale when cotton is stripped instead of hand-harvested. An average increase

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of $14 per bale was recorded in a study of harvesting methods during 1952–55. Growers who used improved production methods throughout the season obtained best results. Proper seedbed preparation, adequate insect control, timely cultural practices, and efficient defoliation and stripping operations are necessary to obtain good yields and better than average grades for maximum returns.

ROGERS, R. O., AND BARTON, G. T. OUR FARM PRODUCTION POTENTIAL, 1975. U.S. Dept. Agr. Inform. Bul. 233, 14 pp., illus. Sept. 1960.

To provide for a moderate increase in per capita use of farm products by a U.S. population of 230 million and to meet projected export demands, farm output would need to expand more than 35 percent above the 1956–58 level. Needed increases in production would be greater for livestock than for crops. Indications are that, if the research and extension efforts required to achieve per acre yields at the projected attainable levels are forthcoming, the present productive capacity of agriculture is sufficient to meet these needs.

SCHMIDT, J. R., AND CHRISTIANSEN, R. A. POTENTIAL CROP AND LIVESTOCK PRODUCTION AND NET FARM INCOME ON DOMINANT SOILS IN NORTHWEST WISCONSIN. Univ. Wis. Res. Bul. 219, 71 pp., illus. May 1960. (Agr. Res. Serv. cooperating.)

Crop yields with recommended cropping practices would be substantially higher on all soils analyzed than yields with past cropping practices. Potential yield of corn, for instance, is estimated to range from 70 to 105 bushels per acre, compared with past yields ranging from 52.1 to 69.9 bushels. On 185-acre farms on the soils analyzed, adoption of the most profitable livestock organizations under recommended cropping practices would substantially increase net farm income over that from past cropping practices on all soils. The increase would exceed $2,000 on 6 of the 12 soils.

THOMPSON, JOHN W. CHANGES IN PROCESSING AND MARKETING HIDES. U.S. Dept. Agr. AMS-410, 18 pp. Oct. 1960.

Use of recently-developed machines for cleaning cattle hides can produce substantial savings and other advantages in marketing. Cleaning hides by machines can reduce shipping weight and freight costs by about 20 percent and eliminate many defects often found in cured hides.

ULLRICH, E. O. JR., SCHAFFNER, L. W., EDGERLY, C. G., AND EVELETH, D. F. OPPORTUNITIES FOR IMPROVING INCOME FROM CREAM PRODUCTION IN NORTH DAKOTA. N. Dak. Agr. Expt. Sta. Bul. 429, 24 pp., illus. Sept. 1960. (Agr. Res. Serv. cooperating.)

On many of the grain farms of Henry and LaMoure Counties on which production of farm-separated cream is a minor enterprise, higher returns from cream could be obtained by improved practices, with little or no added investment. With recommended feeding rates and use of high-quality roughage, many farmers could save up to $25 per cow. Profitable use of skim milk can often mean the difference between profit and loss, especially for low-producing herds.

WALDORF, WILLIAM H. OUTPUT OF FACTORIES PROCESSING FARM FOOD PRODUCTS IN THE UNITED STATES, 1909–1958. U.S. Dept. Agr. Tech. Bul. 1223, 43 pp., illus. Sept. 1960.

Food processors get about 20 cents of each dollar spent by consumers for farm food products. Factory production of processed farm foods increased at the rate of 2.6 percent per year between 1947 and 1958. This rate of growth was slower than the rate during World War II, but substantially faster than the average annual rate in the prewar period, 1909–39.

WEIDENHAMER, MARGARET. MOTHERS' OPINIONS OF FIBERS IN CHILDREN'S CLOTHES. U.S. Dept. Agr. Mktg. Res. Rpt. 429, 37 pp., illus. September 1960.

Cotton was regarded as the outstanding fiber for children's clothing by 2,476 mothers interviewed in nationwide study. Cotton was the leading fiber for boys' sport shirts and pants for school wear and for girls' blouses, dressup dresses, slips, and skirts for school wear. Wool was preferred for outer jackets or short coats. Among the manmade fibers, nylon was generally the leader.

WILSON, DALTON L., PENCE, BETTY SUE, AND PHILLIPS, VICTOR B. MARKETING COSTS AND MARGINS FOR LIVESTOCK AND MEATS. U.S. Dept. Agr. Mktg. Res. Rpt. 418, 65 pp., illus. Nov. 1960.

Since 1919 the farmer's share of the consumers's dollar spent for meat has varied from 39 cents to 79 cents a pound for choice grade beef, 36 to 75 cents for pork, and 41 to 74 cents for choice grade lamb. In 1959 the farmer's share was 62 cents for beef, 48 cents for pork, and 53 cents for lamb. Overall marketing margins reached new highs in 1959 for choice grade beef and lamb and for pork.

Statistical Compilations

FARM ECONOMICS RESEARCH DIVISION, ARS. CHANGES IN FARM PRODUCTION AND EFFICIENCY. A summary report. U.S. Dept. Agr. Statis. Bul. 233, 48 pp. Revised July 1960.

FARM ECONOMICS RESEARCH DIVISION, ARS. FARM REAL ESTATE DEBT. U.S. Agr. Res. Serv. ARS 43-131, 7 pp., illus. July 1960.

FARM ECONOMICS RESEARCH DIVISION, ARS FARM REAL ESTATE TAXES. RECENT TRENDS AND DEVELOPMENTS. U.S. Agr. Res. Serv. ARS 43-130, 14 pp., illus. Aug. 1960.

U.S. DEPARTMENT OF AGRICULTURE. MAJOR STATISTICAL SERIES OF THE U.S. DEPARTMENT OF AGRICULTURE. HOW THEY ARE CONSTRUCTED AND USED. MARKET NEWS. U.S. Dept. Agr. Handb. 118, vol. 10, 62 pp., illus. Sept. 1960.

This is one of a series of reports designed as a reference on statistics of the Department of Agriculture. It describes the market news program carried out by the Agricultural Marketing Service in cooperation with States.

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